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CONSTRUCTION AND RELATED INDUSTRIES

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USSR REPORT

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CONSTRUCTION PLANNING AND ECONOMICS

'PRAVDA' CALLS ON CONSTRUCTION INDUSTRY TO IMPROVE PERFORMANCE

Moscow PRAVDA in Russian 4 Feb 83 p 1

[PRAVDA 4 Feb 83 editorial article: "Build Efficiently"]

[Text] The country obtained some 200 large industrial plants from builders last year. The production potential in transport, agriculture and the social sphere grew significantly. Evaluating last year's results, Soviet people were sincerely grateful that work was well done at construction sites, in any weather and frequently in uninhabited regions. They were grateful above all to the workers and crew leaders, as well as to the skilled workmen and foremen working directly with the work crews, performing a dual role as construction organizers and work crew educators.

But unresolved problems and shortcomings in capital construction are obvious. They are attested to by the empty shells of unfinished plants, farms and houses, the millions of rubles spent to correct faulty products, and hundreds of thousands of tons of inefficiently used metal, cement and other materials. The November (1982) Plenum of the CPSU Central Committee noted that a faster return on the enormous resources devoted to economic development requires a more decisive improvement in both planning of capital work and organization of construction itself.

With a present growth in capital investments at 4.4 percent, it is planned to increase the entry of basic funds into use by 5.9 percent. In other words, the task has been posed of achieving maximum results at minimum cost, which can only be done by concentrating manpower and resources on completing construction under way. The main construction ministries, Mintyazhstroy, Minstroy and Minpromstroy, must perform 10-15 percent more contracting work than last year.

These are critical, complex tasks. Despite introduction of the index of commercial construction product, aimed at speeding up job completion, the gross index is still in force as well: the volume of contracting work. It determines the size of the wage fund, quarterly bonuses and overhead charges. But it's easier to build up the "gross" at the initial stage of construction, where expensive, material-intensive work is performed, and harder to do in the final stages.

The directors of ministries and construction and assembly organizations need to show a genuine concern for the public interest, and concentrate their strength on start-up projects. Employees of Stroybank must also combat the pursuit of "gross." They are correct in not financing some of the work at new and on-going projects if starting capacity is being built behind schedule.

Construction is a conveyor, where each participant's role is decisive in its own way. The editors of Pravda continue to receive letters and telegrams to the effect that the enterprises of Minchermet and Minstroymaterialov are failing to deliver metal and cement, which hampers builders' work. Assembly workers spend much of their time repairing factory defects in equipment. The level of final deliveries is low. Many start-up sites still lack equipment delivery schedules, which prevents efficient work organization. There is poor responsibility of machine builders and buyers for fulfillment of contractual obligations. This cannot be tolerated.

Construction must be further improved and organized. The main contracting ministries are capable of successfully dealing with an intensive work program. Their production funds have grown considerably in recent years, while the growth in labor productivity lags behind the planning targets. Loss of work time frequently reaches 20 percent. Production capacity of construction industry firms is frequently used inefficiently.

The main route to raising labor productivity, and thus successfully fulfilling our plans is to improve the construction management system and use the achievements of science and technology and leading experience. It is possible today to significantly expand the scale of introduction of normative, conventional net output--a new index that will become the norm for all builders next year. The practice of "mutual amnesty" for nonfulfillment of contractual obligations must be eliminated from business relations. Team profitable operation and integrated sub-contractor competition on the "Working relay race" principle are very effective. This has been clearly confirmed, for example, by some twenty groups headed by I. Lyapko's brigade, who contracted to build one of the facilities of the Oskol'sk electro-metallurgy integrated works.

However, at many sites the workers don't work as much as they wait. The dissolution of profitable crews at several sites is also cause for alarm, and merits special attention by Party construction site committees and Party gorkoms, obkoms and kraykoms. Their job is not to replace economists, but to strengthen engineers' and production leaders' responsibility for their assigned job, to see to it that the decisive sections are headed by competent, resourceful people with organizational skills and the ability to innovate.

The focus of Party committee political educational and ideological work is the team, the site. A correct approach has been taken by Saratov communists, who are seeing to it that an effective Party group is created in each primary work crew. Start-up of facilities on schedule must be ensured by expanding worker participation in production management, and developing their labor activity. At the same time, all attempts to divert material resources to

unplanned projects, and finish one project "ahead of schedule" while condemning many others to delays, must be countered.

The importance of the tasks facing builders obliges each person involved in plant construction or modernization to critically evaluate the style of their work and raise their labor performance, whether they are a worker of minister, Gossnab or purchaser service specialist, Party worker or financier. This will help this year's construction plan to be fulfilled completely, and on schedule.

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CSO: 1821/76

ECONOMISTS DISCUSS INADEQUACY OF CONSTRUCTION DATA

Moscow VESTNIK STATISTIKI in Russian No 1, Jan 83 pp 17-24

[Article by A. Orlova, candidate in economic sciences, laboratory chief of the Scientific Research Institute of the USSR Central Statistical Administration, and V. Sivorinovskiy, candidate in economic sciences, divison chief at the Scientific Research Institute of the USSR Central Statistical Administration: "An Improvement of Capital Construction Statistics and the Construction Project Register"]

[Text] An increase in the efficiency of construction and of capital investments is especially topical in the 11th Five-Year Plan in which capital construction has been given the task of bringing about a further increase and qualitative improvement of the economy's fixed capital with a smaller than during the previous five years absolute and relative increase in capital investments.

In the light of the accomplishment of this task, the Basic Directions for the Economic and Social Development of the USSR for 1981-1985 and for the Period Until 1990 provides for an increase in the efficiency of capital investments, the concentration of capital investments at the most important construction projects, a decrease in construction time, an even and overall commissioning of production capacities and objects during the course of the year, the reduction during the next few years of the amount of incompleted construction and of stocks of uninstalled equipment to their norms, and the performance of construction in accordance with the most progressive and economical plans.

The necessity for control over the fulfillment of the above directives is making additional demands upon capital construction statistics. At the present time it provides information primarily on capital construction plan realization and to a lesser extent on the concrete output of capital construction. However, this data is insufficient for controlling the efficiency of capital construction. Account has to be taken of the specific nature of the output of capital construction which consists in the fact that frequently a large number of organizations participate simultaneously in the process of its creation, and that this output is created, as a rule, over a period of several years, while its qualitative characteristics manifest themselves after the conclusion of the construction. For this reason, the temporal aspect of a statistical watch over the planning, creation, and consumption of capital construction output is very important.

Until very recently information on capital construction output in a temporal aspect was formed by means of the organization of surveys, was not sufficiently full, and was gathered and analyzed not during the course of construction, but upon its conclusion; it had more the character of the establishment of facts than of precautionary signposts. At the same time, the importance of the temporal aspect in analysis is increasing in connection with the increased role of the 5-year plan, which, in its turn, sets statistical agencies the task of ensuring the receipt of the basic indicators in a running total from the beginning of the 5-year plan and their comparison with the planning indicators, and of keeping an eye on the use of capital investment and construction and installation work ceilings and on the stability of planning indicators.

This makes it possible to reflect the course and state of a specific process on the basis of information about quantitative changes in units of totality with regard to essential characteristics which have been singled out in the observation program. The construction site (object of construction) is such a unit of observation in capital construction.

The statistical register of construction sites and construction objects is a list of construction sites and a set of individual characteristics and indicators which characterize the construction sites and construction objects. In its technological aspect the register is a system for obtaining, renewing, and storing data which ensures the formation of an information mass made up of written recordings each of which contains the features and indicators which characterize a unit of observation. The use of modern computers creates the conditions for obtaining information on a union level in a disaggregated form, and for studying complex economic systems on the basis of observing individual concrete elements of these systems. An additional effect is achieved here not only from the fact that at all levels of information processing statistics operates with disaggregated data, but also that the register makes it possible to use a single introduction of information repeatedly for the solution of a large number of interconnected problems.

The organization of a continual watch over construction sites and construction objects on the basis of a register increases the analyzability of information, gives it a concrete address and a precautionary character, and promotes an improvement of the quality of base information and a decrease in expenditures for the collection and processing of data.

It should be emphasized that the information which is contained in the construction projects register responds to the tasks of statistical observation and of an analysis of the realization of those directions of improving the economics of capital construction which are reflected in the 12 July 1979 Decree of the CPSU Central Committee and USSR Council of Ministers, "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Improving Work Quality." This is achieved by including in the register observation program above all such indicators as make it possible to control the fulfillment of the plan for the commissioning of production capacities and objects which have been prepared for the production

of output and the provision of services; to keep a watch on construction schedules and on the utilization of capital investments according to the estimate during a period starting with the beginning of construction; to exercise control over the stability of planning assignments and the fulfillment of the capital construction plan in a running total by years of the 5-year plan; and to provide a characterization of the fulfillment of assignments and of the process of changes in the reproduction structure of capital investments with regard to the necessity for a preferential direction for them aimed at the reconstruction and reequipping of production.

A definite amount of practical experience has been accumulated in our country and abroad in the use of the register form of observation in capital construction. For example, in the Czechoslovakian SSR a construction sites register with an estimated value of more than two million kroners has been organized. The data is presented and processed at the various stages of the investment process: after the approval of the planning assignment, of the work plan, during the course of construction, upon the completion of construction (by acceptance results), and during the period of mastery (during the course of a year after the completion of construction). In addition, at all of the stages of the investment process and of the presentation of information a single system of indicators, classifications, and nomenclatures is used. Thus, the register contains information about planned, in process, and completed construction projects. The information in the register is used to characterize the state and course of capital construction, its results (the commissioning of production capacities, reconstruction), and for evaluating the economic efficiency and technical level of construction. The data can be obtained in branch, organizational (departmental), and territorial break-downs, with regard to the time factor.

In the USSR the register form of observation was used in planning the Republic Automated Management System of the Latvian SSR in the system "Capital Construction." The units of observation in the register were not only all of the real construction projects, but also the so-called conventional ones. The latter include expenditures and work which it is permitted to perform in an established procedure on the basis of the total allocated capital investments (for example, the purchasing of machinery, equipment, agricultural equipment and tools which are not in the construction project estimates, expenditures for the formation of the basic herd, and others). In connection with the organization of the register, the concept of "construction project" was also clarified. A construction project is seen as the aggregate of buildings and installations, the construction, expansion, or reconstruction of which is planned or is carried out in accordance with a single planning estimate: a technical (technical working) plan with a summary estimate for it. But if objects are envisaged in the summary estimate whose construction area is located in various rayons (cities) of a republic, or if the construction of objects in two or more branches of the planning of capital investments is planned, then the totality of objects in each rayon (city) and in each branch is regarded as a separate construction project.

As practice has shown, the observation of conventional construction projects greatly complicates the organization of the receipt of information, and makes it difficult to analyze construction length and lag, incomplete construction, the readiness of construction projects, the quality of the capital construction normative base, and others. In addition, it becomes necessary to move from construction projects in the register to real construction projects. In contrast to a real one, a "conventional" construction project does not have a history, and setting it off as a unit of observation was dictated by an endeavour to obtain summary indicators characterizing the utilization of capital investments for the data of the construction projects register. This kind of organization of the register proved to be effective, since the summary indicators for the register's data diverged from the summary indicators for the builder's data, and in subsequent work on the planning of the Automated State Statistics System and the Republic Automated Management System of the Latvian SSR it had to be rejected.

In 1975-1977 the Republic Computer Center of the Central Statistical Administration UzSSR jointly with the Scientific Research Institute of the USSR Central Statistical Administration carried out the following work to create a construction projects register: the posing and methodology of the economic tasks of the statistical observance of construction projects; the development of the form of the input documents necessary for the organization of the data base, and of instructions on how to fill them out; and the development of program and technological support which realizes the full cycle of the functioning of the register in a regulated mode and in a requisitions mode. In 1977 the register of construction projects and construction objects was introduced for experimental operation, and since August 1978 the Republic Computer Center of the UzSSR Central Statistical Administration has been using it as a basis for regularly issuing additional statistical information on the most important construction projects (monthly bulletins) to the republic's executive and planning agencies.

The bulletins' tables contain data on the fulfillment of the basic planning indicators for the construction projects and objects in combination with a large number of indicators on the course of the construction and on the utilization of the estimated cost. For example, the table on the fulfillment of the capital investments plan also had included in it the indicators of the scheduled beginning of construction according to the plan and in actuality, full estimated costs, the residual on the estimated ceiling, technical readiness, and advance (behind-schedule) fulfillment of the current year's plan in calendar days. The table which characterizes the fulfillment of the commissioning of capacities and capital plan also shows the planned schedule for commissioning to full planned capacity, full estimated cost, and the employment of fixed capital in a running total beginning with the start of construction.

The summary tables broken down for ministries and territories (oblasts) reflect: the average length of the construction, estimated cost (total and for a single construction project), technical readiness, percentage of plan fulfillment, outstripping (lagging), and other indicators. The grouping tables

were made up by ministries for all construction projects and separately for start-up ones, and with construction projects grouped according to percentage of plan fulfillment for capital investments and construction and installation work.

A year's indicators are accumulated and stored for all time in the register, while current information is stored for two years. The obtaining and storing of monthly indicators makes it possible to compare actual data with the indicators of the corresponding period of the past year, and also to determine technical readiness and estimated ceiling residuals as of any month, and not only as of the end of the year. Thanks to the development and introduction of a capacities classifier, the construction projects register which is being used at the Republic Computer Center of the UzSSR Central Statistical Administration makes it possible to obtain summary results for named capacities.

It was decided to spread the positive experience of the use of the construction projects register at the Republic Computer Center of the UzSSR Central Statistical Administration to the entire system of the USSR Central Statistical Administration. In addition, it was planned to reduce the observation program, not to introduce the special forms of reporting used at the UzSSR Central Statistical Administration, but to adapt existing reporting so as to avoid the duplication of indicators. The Administration for Capital Construction Statistics of the USSR Central Statistical Administration together with the Scientific Research Institute of the USSR Central Statistical Administration and the Republic Computer Center of the UzSSR Central Statistical Administration have developed and realized proposals on the composition of the input documents and on the processing of the program and technological support of the construction projects register.

In 1979 the construction projects register underwent a test whose purpose was to check and polish the forms for the input documents and instructions on filling them out, for program support, and also of the organizational structure of the register (information collection, processing, and transmitting systems). The test was conducted on a representative mass which included 1,500 construction projects of 26 ministries located on the territory of three union republics (RSFSR, Kazakh SSR, and Uzbek SSR). These construction projects differed not only with regard to their departmental and territorial membership, but also with regard to their ceilings, the character of their construction (new construction projects or construction projects at operating enterprises), equipment (domestic, overall imported, and others), and the nature of the construction (new, carry-over, start-up). The reporting data on 1,200 construction projects located on the territory of the RSFSR was processed by 10 branch computer centers.

As a result, it was possible to establish the level of the content development and technological suitability of the reporting forms which had been recommended for the construction projects register, and to make amendments and supplements to the instructions on the procedure for drawing up reports. At the same time, it became clear that the approach which had been adopted to the reflection of production capacities by means of equating each type of these capacities

to the object which includes them, although it does make it possible to a certain extent to solve the problem of attaching capacities to concrete objects, it cannot produce the kind of effect which can be achieved with a capacities classifier.

The register form of observation greatly increases the possibilities for controlling incoming information at all levels and, thereby, promotes an improvement in the quality of the initial data. The conclusion based on an analysis of the results of testing to the effect that decision-making on the basis of the register's information can be effective only with a periodicity for incoming data of no less than once a quarter is a very important one.

With the register form of supervision of construction projects there are substantially greater opportunities for conducting statistical analysis. Thus, construction project groupings (and, correspondingly, capital investment ones) have been developed for various characteristics: character, support level, stages of construction, technological structure of capital investments for full estimated cost and planned for a year, the construction project ceiling, its technical readiness, time in stage of construction, and so forth. For example, for 60 surveyed enterprises the proportion of construction and installation work in the estimated cost came to 67.3 percent, and in capital investments for 1978--72.9 percent. The grouping of construction projects on the basis of the share of construction and installation work in the estimated cost showed that in only 11 of the construction projects out of 60 it was less than 60 percent, in 41 construction projects it fluctuates from 60 to 80 percent, and in 8 construction projects it even exceeds 80 percent. The share of equipment in estimated cost for all of the construction projects came to 22.7 percent, and for construction projects based on overall imported equipment--28.7 percent. The large expenditures for import equipment are increasing demand for compliance with normative and planned construction schedules, since schedule delays lead to the freezing of resources, the obsolescence of expensive equipment, the impossibility of employing sanctions against a supplier, and so forth.

Also of definite interest are the construction project groupings by technical readiness and the utilization of the annual ceiling on capital investments or construction and installation work (see Table 1) which are obtained with the register form of supervision.* (See next page for table.)

From the data in Table 1 it can be seen that more than half of the construction projects (33 of 60) utilized their annual capital investment ceiling by less than 75 percent, while one-third of them were construction projects with a technical readiness of more than 50 percent. And, on the contrary, one-third of the construction projects which utilized more than 75 percent of the capital investment ceiling comprise construction projects with a technical readiness of less than 50 percent. The data which has been obtained testifies to an

*The data in this and in the subsequent tables has been obtained on the basis of calculations performed at the Scientific Research Institute of the USSR Central Statistical Administration.

Table 1

Distribution of Construction Projects by Technical Readiness and Utilization of the Annual Capital Investment Ceiling

Groups of construction projects for utilization of the capital investment ceilings, percent / Groups of construction projects by technical readiness, percent	Less than 25	25-49	50-75	More than 75	Total construction projects
Less than 25	5	7	4	2	18
25-49		4	2	8	14
50-75		1	5	3	9
More than 75		1	4	14	19
Total construction projects	5	13	15	27	60

insufficient concentration of resources at start-up construction projects. The underutilization of the capital investment ceiling, and the scattering of resources over a large number of construction projects leads to the nonfulfillment of the fixed productive capital commissioning plan. For the above aggregate, the fixed capital commissioning plan was fulfilled by 37.2 percent in 1978, and in a running total from the beginning of the 5-year plan--by 31.1 percent, with a capital investment ceiling utilization of 74.6 percent (including construction and installation work--of 70.8 percent), and in a running total from the beginning of the 5-year plan--by 69.5 percent.

The underutilization of the capital investments and construction and installation work ceiling and the failure to fulfill the plan for commissioning fixed productive capital and production capacities is accompanied by an increase in building schedules and in amounts of incompleted construction. Table 2 shows a grouping of the same construction projects for time in the construction stage and their technical readiness. (See next page for table.)

The data in Table 2 testify to the fact that, basically, enterprises which are in the construction stage for a short period of time have the lowest technical readiness. Enterprises whose construction period exceeds three years have a relatively high technical readiness. However, among the surveyed enterprises there are enterprises with a large construction period and low technical readiness. Thus, 31 of 60 have a technical readiness lower than 50 percent, but 7 of them have been in the stage of construction for more than three years. The construction project aggregate being studied is heterogeneous with regard to estimated cost. One-fourth of them are low-ceiling construction projects (up to 3 million rubles), and more than half have a ceiling of from 5 to 15 million rubles. A study of the closeness of the connection between estimated cost and planned construction length showed that there is a weak dependency

Table 2

Distribution of Construction Projects by Length of Construction and Technical Readiness at the End of 1978

Construction project groups for technical readiness, percent / Construction projects groups for time in construction stage	Less than 25	25-49	50-60	70-89	90 and more	Total construction projects
Up to one year	6	1			1	8
From one year to three years	11	6	3	1	2	23
From three to five	1	4	4	9	4	22
From five to seven		2	1	2		5
More than seven years				2		2
Total construction projects	18	13	8	14	7	60

between these indicators (a linear correlation coefficient of 0.306). This result is to a substnatial extent based on the fact that the length of construction was showed not for the original plan, but for the corrected one, that is, with regard to the actual utilization of capital investments and of time spent in the construction stage. A failure to observe construction schedules is characteristic of both construction projects with a large ceiling and of those with a small one (Table 3): only 6 of the 60 construction projects exceeded the planned construction length. In a comparison with the original plan, the results could be somewhat different.

Table 3

Construction Projects Grouping by Planned and Actual Construction Length

	Total construction projects	Of them, in the construction stage					
		Up to 1 year	From 1 to 2 years	From 2 to 3	From 3 to 4	From 4 to 5	5 years and more
Total construction projects	60	8	15	8	14	8	7
Including with a planned construction length of:							
Up to 1 year	2	2					
From 1 to 2 years	3		3				
From 2 to 3	12	3	5	1	3		
From 3 to 4	13	3	3	2	3	1	1
From 4 to 5	17		4	5	4	3	1
More than 5 years	13				4	4	5

If the corrected planned length of construction is closer to the actual length, then the length of construction in accordance with the original plan moves closer to the normative one or coincides with it. The degree of the normalization of the process of capital investments utilization can be judged from the indicator which expresses the relationship between actual technical readiness as of a specific date to normative technical readiness as of the same date. The closer this indicator is to one, the more normalized the process. Table 4 cites actual and normative data on the utilization of capital investments at 10 new construction projects of a single ministry.

Table 4

Characterization of New Construction Projects Relative to Capital Investments Utilization

Construction Project	Technical readiness at end of year, percent						Relationship of actual readiness to normative readiness at end of 1978
	According to the normative			Actual			
	1976	1977	1978	1976	1977	1978	
Start-up projects No. 1	66	95	100	9.0	67.3	90.0	0.9
Carry-overs since 1977:							
No. 1	22	70	97	14.9	25.9	46.0	0.47
No. 2	--	16	71	--	0.8	8.2	0.12
No. 3	17	65	100	4.7	4.7	20.3	0.20
No. 4	72	100	100	0.24	1.24	6.9	0.06
No. 5	62	100	100	7.9	21.1	49.3	0.49
Newly begun in 1978:							
No. 1	--	--	7	--	--	0.9	0.03
No. 2	--	--	10	--	--	0.6	0.06
No. 3	--	--	18	--	--	7.1	0.40
No. 4	--	--	17	--	--	16.5	0.97

As we see, the process of the utilization of capital investments deviates from the normative in all construction projects groups. Five enterprises which were carried over from 1977 had not been sufficiently provided with capital investments to complete their construction within the normative schedules, and, at the same time, in 1978 the construction of four additional projects was begun. Moreover, as early as the first year of construction in three of them the process of the actual utilization of capital investments deviates seriously from the normative. In 10 new construction projects the relationship of actual readiness to normative readiness comes to an average of 0.41, and the same indicator for construction projects newly begun in 1978 came to 0.39. The regular presentation of this kind of analytic information would help to improve the quality of planning decisions in the composition of the list and the title lists of construction projects.

The possibility for increasing the analytic statistical information on capital construction in the process of organizing the register form of construction project supervision which the authors have been attempting to disclose in this article can be realized on the basis of both the above and other sources of information, particularly on the basis of reporting according to Form No. 8-kc "Report on Enterprises Under Construction and Reconstruction." What is of sole importance is that the systematic introduction of the construction projects register be speeded up in order to give better support to executive agencies by providing them with the necessary information about the condition and course of the construction of enterprises and objects.

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GEORGIAN PRICING EXPERIENCE DETAILED

Tbilisi ZARYA VOSTOKA in Russian 1 Mar 83 p 2

[Article by Zigfrid Retter, chief engineer of plans of new estimated norms and prices in construction of the Georgian SSR, the Georgian SSR State Institute of City Planning and Construction: "Without Delays"]

[Text] More than 3 years have already passed since the CPSU Central Committee and the USSR Council of Ministers adopted the decree on the further improvement of the economic mechanism. The decree also concerned capital construction. The set of measures envisaged in it is rallying the construction workers so that they would place projects into operation more rapidly and would build them with a good quality and with fewer expenditures.

In recent years in capital construction substantial quantitative and qualitative changes have occurred, which have turned it into the largest sector of the national economy. The technical equipment of contracting organizations has improved, the amounts of construction and installation work and the degree of its industrialization have risen, the scientific developments in the sector have increased. Much has been done.

However, as has been repeatedly noted at subsequent CPSU Central Committee Plenums, the state of affairs in capital construction does not completely meet the requirements of the economic and social development of the country at the present stage. The economic operations of contracting organizations are insufficiently efficient. The growth rate of the labor productivity and profitability of contracting organizations and the output-capital ratio are low. Thus, in our republic many contracting construction organizations last year did not achieve the planned profitability, having completed the year with substantial losses. There are many reasons here. One of them is the imperfect estimated norms and prices in construction.

They have been in effect in our republic since 1969. However, the wholesale prices for individual types of construction materials in the past 10 years have changed several times, and this led to an increase of the cost of all capital construction. Therefore, after the adoption of the decree on the further improvement of the economic mechanism new wholesale prices for industrial products, including construction materials, items and components, were introduced. Since 1 January 1982 compensation has been paid to contracting organizations to cover the difference between the wholesale prices, which were incorporated in the 1969 estimated prices,

and the new wholesale prices of 1982. However, the average amounts of this compensation do not always cover the gaps, which have actually arisen at some construction projects, in the cost indicators of construction materials.

It is envisaged by a decision of superior organs of the republic that the new estimated norms and prices in construction, which are being introduced as of 1 January 1984, should reflect the present level of the equipment, technology and organization of construction and should provide contracting organizations with the socially necessary expenditures.

As of 1 January 1984 the estimated cost of capital construction should be determined on the basis of the new estimated norms and prices for construction and installation work, the new rates for transportation and other services, which were put into effect on 1 January 1982, and the new limited expenditures.

Much work on the drawing up, coordination and approval by an interdepartmental commission of new transportation networks for the delivery of local construction materials to individual rayons of the republic was done in the republic for determining the new estimated prices for local construction materials. These transportation network were elaborated on the basis of numerous certificates and measures of distances with respect to all the regions of the republic. Representatives of the clients and contractors, the local soviets, transportation organizations and the offices of Gosbank and the All-Union Bank for Financing Capital Investments took part in their compilation.

As a result of the performed work 12 zones of the effect of estimated prices were established in our republic, of which 6 zones of industrial civil construction encompass the territories of all cities and urban-type settlements and 6 zones of rural construction encompass all the remaining regions of the republic. In addition to the 12 zonal estimated prices, 2 prices of a uniform republic level were established for industrial civil and rural construction.

A special collection of estimated prices for local construction materials and components for nonspecialized construction on the territory of the republic was elaborated by the Georgian State Institute for the Planning of Construction after the specification of the list of local construction materials and items. This collection was approved in 1982 by the Georgian SSR State Committee for Construction Affairs for use as of 1 January 1984 when drawing up the estimates for nonspecialized construction: residential housing, industrial, rural and so forth.

When discussing questions of estimates in construction, it is necessary to touch upon the questions of the capital repair of buildings and structures. The sharp increase of fixed capital in the national economy has caused the corresponding substantial increase of the expenditures which are necessary for assuring the normal operating conditions of this capital. The amount of annual amortization deductions increases in proportion to the increase of the fixed capital, and at present the annual amount of construction and installation work in capital repair comes to approximately 30 percent of the amount of construction and installation work in capital construction.

The performance of construction and installation work in capital repair basically requires the same resources as does capital construction, for example, workers of

similar occupations and skills, the same basic construction materials. It turns out that capital repair according to all the characteristics should be assigned to the sector "Construction."

In this connection it is deemed necessary to assign the functions of the lawmaker in the capital repair of buildings and structures to the USSR State Committee for Construction Affiars, which is the lawmaker in capital construction. Just as in capital construction, the changeover to the new estimated norms and prices in capital repair should be made on 1 January 1984.

The fact that the majority of clients so far have still not determined the list of projects, the placement of which into operation is planned for 1984, and have not specified the physical amounts of construction and installation work, arouses alarm concerning this question. So far the cost of the equipment in 1982 prices has not been calculated for such projects. The drawing up of the limits and the conclusion of contracts with design organizations for the compilation or recalculation of the estimates in the norms and prices of 1984 have been dragged out excessively. This delay in the future can lead to the overloading of the budgetary subdivisions of design organizations during the second half of the year and as a result can lead to undesirable difficulties when making settlements with contracting organizations for the projects which have been completed and put into operation in 1984.

Therefore today it is necessary to take prompt steps for the specification of the amounts of estimated work, which is to be fulfilled and determined by the performers of this work. For the present there is still time, but the business with the changeover to the new estimated norms and prices must not be delayed. It will be too late to make up for lost time.

7807
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SIBERIAN BUILDERS DRAW ON ACADEMIC SUPPORT

Moscow STROITEL'NAYA GAZETA in Russian 27 Mar 83 p 2

/Article by V. Bokov, secretary of the Novosibirsk CPSU Obkom: "In Union with Science"/

/Text/ Science is well developed in our oblast, as we know. Novosibirsk builders, among others, give much attention and effort to accelerating scientific-technical progress.

Much is being done by the administrative collective of the Sibakademstroy. Here all facilities are submitted strictly according to schedule and with high quality (average evaluation rating -- 4.3), while the output per worker comprises 13 thousand rubles per year. Also successfully handling the implementation of plans and socialist responsibilities were the collectives of the Novosibirskavtodor, and the trusts of Sibprodmontazh, Vostokburvod, Novosibirskoblstroy, Novosibirskelektrodstroy, Svyaz'stroy, and others. The trusts of the Sibpromventilyatsiya, Novosibirskpromstroy and Sibelektromontazh have been awarded Challenge of Red Banners of the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the Komsomol Central Committee. This success is explained primarily by the fact that the above-named organizations skilfully utilize the achievements of science and technology, as well as advanced methods of labor organization.

In creative cooperation with the scientific-research and educational institutes, specialists at the Vostokburvod trust, for example, first introduced the new technology of revealing water-bearing layers with direct water wash instead of the argillaceous and natural wash solutions.

Much interesting and valuable work may be seen in the sub-divisions of the Glavnovosibirskstroy and the construction management of the Sibakademstroy. At the beginning of the current five-year period the institutes of the Siberian section of the USSR Academy of Sciences and the builders concluded an agreement on creative cooperation, signed by 20 directors of institutes and management organizations. This form of cooperation makes it possible to develop and introduce in the shortest time highly effective engineering and technology.

The organizational beginning for the introduction of scientific developments and foremost experience in the subsections of the Sibakademstroy is the plan for technical development which is being developed annually on the basis of the five-year program. This plan is necessarily discussed and ratified at open party meetings and in the working collectives. The plan dealing with construction as a whole is discussed at the expanded meeting of the party committee. It has become systematic to discuss biannually the course of implementation of the designated program after a thorough investigation by a commission from the party committee.

The daring of experimentors and practitioners gives noticeable results. Today, two or three years are required for the development of a topic, instead of the five to seven required earlier. There is also a significant economic advantage. The introduction of developments of the scientific institutes of the USSR Academy of Sciences Siberian Section in the subdivisions of the Glavnovosibirskstroy alone has made it possible to save about a million rubles in the past four years and to reduce labor expenditures by tens of thousand of man-days.

Twice a year, the construction section of the party obkom conducts an analysis of the implementation of socialist responsibilities taken by the collectives. It also conducts regular conferences with party committee secretaries, giving them active aid in solving the problems which might arise. The results of the joint efforts are clearly evident: the capacities for large-panel house building have almost doubled and today emprise over 700 thousand square meters.

The introduction of achievements in science and technology in capital construction begins, as we know, with project design. Today in Novosibirsk there are over 50 project, scientific-research institutes and design bureaus working on the development of technical documentation for capital construction and employing over 22,000 specialists. The geography of their activity is also extensive. Numerous institute collectives are making a significant contribution to the development of project decisions for the complex development of the productive forces of Siberia and the Far East.

Here is a concrete example. The Sibakademstroy management collective in Akademgorodok is completing the construction of an experimental installation whose technical documentation was drawn up by the Giprotsement and Sibproyekttsement institutes. This unique installation and its creators have attracted the attention of specialists from various scientific-research organizations, ministries and administrations. The interest is not accidental: scientists and specialists are deeply convinced that the new technology in cement production opens broad possibilities for the national economy.

The questions of introducing scientific-technical achievements are the center of attention for party organization managers at building sites and institutes. In recent years, the work of some of these has been studied and examined at the obkom party bureau. At the obkom plenum held in April of 1981, the

accumulated experience of certain collectives of scientific-research and project institutes was generalized and concrete recommendations given for further improvement in their activity.

We are convinced that manufacturers are not the only ones seeking a union with science. Science is also vitally interested in a bond with production. And our task is to unite their efforts, to interest scientists and producers, to create a regime most favorable for highly productive labor.

But it is not so easy to solve all these problems. Oblast builders, unfortunately, must still utilize secondary results. However, are there few problems requiring the most serious attention? Let us take for example the creation of materials for hermeticizing joints in outside wall enclosure constructions of panel houses and administrative buildings erected in Siberia. This problem is so complex that it cannot be solved by the builder alone. It is also too great for the scientific-research institutes of the USSR Gosstroy. And who, for example, will create the materials for installing mastic non-rolled roofs, usually implemented by the mechanized method? It is still difficult to answer this question.

Many other problems also arise when we speak of the specifics of construction-installation work technology and its mechanization under the severe conditions of Siberia. Therefore, it would be useful if the academic institutes would include in their programs and would in planned order embark upon solving at least some of the major construction problems which are beyond the means of the branch scientific-research institutes.

Difficulties sometimes arise also in the realization of studies which have already been completed. The "Stroitel'stvo" section created at the CPSU obkom proposed the study and maximal utilization of ash from thermoelectrical power stations. The task is very serious. The fact is that Novosibirsk builders utilize only 15,000 tons of ash per year out of the 500,000 which are dumped by all the city's thermal power stations. The construction of a special installation for dry extraction of lignite ash is planned at TE-3. However, the USSR Minenergo was unable to allocate funds in time for its construction. Even now there is no promise of solving this problem at the ministry. And it is a pity. This means that the Siberians will not soon have the opportunity of building a greatly needed installation for utilizing ash.

A decisive and more acute section of accelerating scientific-technical progress today is the introduction of research results and foremost experience into the national economy. The implementation of this task is possible only under the condition of a close connection between science and production. Only by this means will it be possible to ensure the radical improvement in capital construction as required by the decisions of the 26th congress of our party and by the November (1982) Plenum of the CPSU Central Committee.

12322
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MOSCOW BUILDERS HOLD RURAL HOUSING SEMINAR

Moscow LENINSKOYE ZNAMYA in Russian 15 Feb 83 p 3

[Article by LENINSKOYE ZNAMYA correspondent I. Grigorenko: "On an Advanced Basis"]

[Text] Last Friday and Saturday a seminar-conference, at which there was a major discussion on the adoption of a comprehensive system of the organizational and technological preparation of production and on measures on the extension of the comprehensive development of settlements and villages with houses of the farmstead type, was held at the vacation center of the construction workers of the Main Administration of Construction of the Moscow Oblast Soviet Executive Committee in Ognikovo of Istrinskiy Rayon. Responsible officials of the Moscow Commitee of the CPSU, the Moscow Oblast Soviet Executive Committee, the party committee of Moscow Oblast organizations and institutions and the oblast committee of the Construction and Building Materials Industry Workers Union, executives of the Main Administration of Architectural Planning of the Moscow City Soviet Executive Committee, the Main Administration of the Construction Materials Industry of the Moscow Oblast Soviet Executive Committee and its subdivisions, the All-Union Bank for Financing Capital Investments and Gosbank, the managers of general construction and specialized trusts and the chiefs of associations and administrations of the staff of the main administration took part in the seminar.

This year the construction workers of the Main Administration of Construction of the Moscow Oblast Soviet Executive Committee have to do much for the accomplishment of the responsible tasks, which were specified by the decisions of the 26th party congress and the May and November (1982) CPSU Central Committee Plenums, on the further development of the national economy and the increase of the well-being of the Soviet people. For the workers of the Moscow area housing alone with a total area of 1.56 million m^2 has to be built. In the plan of placement into operation there are many schools, children's institutions and other projects for cultural, personal and municipal purposes. In all work in the amount of 712 million rubles has to be performed--19.7 percent more than the amount actually performed last year.

Now, as never before, it is necessary to increase the organizational level of the work of the builders and to utilize more completely the reserves for the increase of their labor productivity. One of the most important factors of this is the adoption of a comprehensive system of the organizational and technological preparation of production, which makes it possible to ensure in the best manner the concentration of material, technical and human resources at start-up and especially important construction projects and their most efficient use for the achievement of high end results.

As Yu. N. Savin, first deputy chief of the Main Administration of Construction of the Moscow Oblast Soviet Executive Committee, noted in his report, the first steps on the adoption of the system of the organizational and technological preparation of production have shown its great effectiveness. At the Mosoblinzhstroy Trust No 1, the Mosoblstroy Trusts Nos 3, 5, 12 and 22, for example, the construction conveyor has begun to work more smoothly, the turning over of large production complexes and housing and civil projects has begun to take place more systematically.

The introduction of the organizational and technological preparation of production in specialized subdivisions is yielding quite good results, of which V. V. Borisov, chief of the Administration of Specialized Operations of the main administration, gave an account in his speech. At the Mosoblsantekhmontazh Trust No 1, the Mosoblelektromontazh Trust and the boiler-making combine all the labor-consuming processes have been transferred from the construction sites to the plants. This had a favorable effect not only on the labor productivity of sanitary engineers, electricians and boiler makers, but also on the increase of the reliability and quality of construction.

As N. M. Yegorov, chief engineer of the Main Administration of Architectural Planning of the Moscow City Soviet Executive Committee, L. L. Vartazar'yan, manager of the Mosoblstroykomplektkonstruktsiya Trust, and V. V. Varganov, manager of the Mosoblstroykomplekt Trust No 1, noted, contractual obligations have been concluded between the interested parties, at the basis of which are the rapid preparation of planning estimates with the use of computer equipment, the complete supply of construction projects with components in accordance with the schedules of the Automated Control System of Construction and the preparation of standardized technological documents and annual schedules for the deliveries of materials in strict conformity with the plans of the organizational and technological preparation of production.

L. M. Aronchik, deputy chief of the Main Administration of the Construction Materials Industry of the Moscow Oblast Soviet Executive Committee, and V. F. Korchagin, chief of the Technical Administration of the Main Administration of Construction of the Moscow Oblast Soviet Executive Committee, devoted their speeches to the reserves of the decrease of labor expenditures at construction sites by the increase of the plant readiness of items and the technical support of the plans of the organizational and technological preparation of production with new components and materials, modern technologies and methods of labor.

At the same time at a number of trusts inadequate attention is being devoted to the questions of the preparation of construction work. Hence the irregularities in the work of brigades, the violations of the technology and the upsetting of the standard periods of construction. Such incidents are occurring at the Mosoblstroy Trusts Nos 7, 10, 15, 16, 20 and others. Some general contracting subdivisions frequently accept incomplete planning documents of low quality, without the necessary consultations and permits, which also leads to the prolonging of the periods of construction.

It is impossible to further tolerate such facts. The plans of the organizational and technological preparation of production should become the basic guiding document in the activity of every subdivision. It is necessary at the construction and installation administrations, the mobile mechanized columns and the trusts to create a system of the monitoring and analysis of their introduction and to increase the responsibility for executive discipline.

The designers and clients should display great interest in the end results of the builders. It is important in the immediate future to elaborate and approve measures on the extensive introduction of 2-year continuous planning.

The question of the social reorganization of rural settlements and villages, the construction in the countryside of well-appointed housing, mainly of the farmstead type, as well as sociocultural and personal service facilities was discussed extensively at the seminar-conference. V. T. Shevchenko, deputy chief of the Main Administration of Construction of the Moscow Oblast Soviet Executive Committee, who delivered a report, noted that some expierence in new development has already been gained in the oblast.

But this is only the beginning. Now it is a matter of the changeover to the mass construction of farmstead houses. A base of the construction industry has been and is being created for this. The number of central farmsteads, production centers and remote villages, which are to be rebuilt, has been determined for all the farms of the oblast. As V. V. Shavshukov, deputy chief of the Main Administration of Architectural Planning of the Moscow City Soviet Executive Committee, reported, the planning institutes, which are subordinate to the Main Administration of Architectural Planning, jointly with the clients have elaborated for cooperative and individual construction more than 40 plans of houses of the farmstead type with outbuildings, the use of industrial components and local materials.

Now it is important for the builders to ensure the fulfillment of the outlined plans. Practically all the trusts of the main administration will have to engage in their rayons in the construction of houses of the farmstead type. But the main load still falls to the associations of large-panel housing construction. How are the house builders accomplishing this task? S. I. Simenko, chief engineer of this association, told about this. Much work on the organization of the production of parts of farmstead houses is being performed at all the house building combines. The renovation of individual works is being carried out, new equipment is being prepared. However, the Tuchkovo Rural House Building Combine will be the main developer. With the assimilation of its capacities it is planned to build annually 275 houses of the farmstead type.

Seven technological flows, each of which will at the same time carry out the construction of farmstead housing according to a flow chart, will begin to operate.

Recommendations were adopted on the discussed questions. The seminar participants visited new construction projects--the combine of grain products at the station of Bolshcheviki and a hospital for veterans of the Patriotic War in the settlement of Kryukovo of Solnechnogorskiy Rayon.

Secretary of the Moscow Committee of the CPSU I. Ye. Klochkov took part in the seminar-conference and addressed it.

7807
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RENOVATION OF OLD RESIDENTIAL HOUSING ADVOCATED

Moscow SOVETSKAYA KUL'TURA in Russian 10 Mar 83 p 4

/Article by Professor Dm. Ayrapetov: "Do You Want to Live in an Old House?"/

/Text/ Houses, like people, are born, live a long and useful life, grow old and die. And they, like people, have kind and good doctors whose work and art cure their "ills", prolong their useful life, and return their former beauty. The residents of numerous cities remark gratefully and warmly on the selfless work of architects and restorers who have returned to life the beautiful creations of the past -- monuments of architecture and entire historical-architectural ensembles.

Today we hear less and less of the thoughtless, unfounded demolition of buildings, not only monuments of architecture, but also those which represent the cultural and historical heritage of our cities. The state, public organizations and creative unions have taken them into their protection and are concerned with their restoration and useful utilization. Huge material and labor resources are expended for this purpose annually. Significant work is also being done in capital repair, and reconstruction of buildings which have no cultural and historical value, but which comprise a characteristic part of old urban building.

Today, administrative organizations, departments, and more rarely cultural and domestic institutions are located in the resurrected old houses which, as a rule, are located in the central part of the city and which served as unimproved housing before the capital repair or reconstruction. With rare exceptions, residences are not restored here, but rather migrate in the cities from the central part to the peripheries. The residents displaced by the capital repair of the houses receive separate improved apartments in newly built regions, usually located far beyond the boundaries of the historically formed urban center. In time, local cultural and commercial centers arise here, while the central blocks of the city, where people go only to work, stand empty in the evenings. The windows of their houses stare at you with their black eyes, and the neon store signs cannot replace the warmth and coziness formerly created by the "ever-burning light of familiar windows".

Such a situation is becoming typical for most large cities. One goes on a business trip, comes out of the hotel in the evening to walk through the center and wonders -- what has happened to the mass of people who filled the

sidewalks, stores and cafes and busy streets in the daytime? Later one turns down another street near the center and somehow gets a bad feeling. There isn't a soul, not a single shining window. But it is all very simple. Work is over, the stores have closed and the people have gone to their peripheral "bedrooms" until the next morning.

Unfortunately, this serious problem of "desertion" or even "dying" of urban centers in the evening, which has great social significance and is slowly growing in many old cities, is sometimes in essence pre-planned in the construction of certain new cities. Only administrative and public buildings are planned and built in the center of the city, while residential houses are located as far away as possible, in the suburbs. Other planners are simply convinced that residence in the city center is doomed to discomfort. But the city center must live and breathe (of course, without suffocating) not only during the day, but in the evening, and early in the morning. And it is not necessary to travel to kindgom come in order to go to work.

Moving residences from urban centers to their suburbs also creates serious transport difficulties -- the one-sided transport of passengers in the morning to work in the center, and in the evening from the center to home. In one direction the city transport is overcrowded, and in the other it is half-empty. This problem of pulsating "flow and ebb" gives rise to traffic congestion of personal and service automobiles on the urban highways connecting the center with the regions of mass residential construction. Newcomers very rarely and reluctantly get to the old centers, where, as before, the theatres, museums, exhibition halls and large stores are located.

Is it impossible to preserve residences in the center of the city and after reconstruction of the old residential fund to return it to the city's general fund? It is not only possible, but imperative. Serious attention is being given to this matter in Leningrad. There is such experience in the capitals of the Soviet Baltic republics. Muscovites, too have such experience (but unfortunately here it is significantly lower than the possible and imperative). Our colleagues, the architects of the GDR, Czechoslovakia, Poland, and Hungary, have long and seriously been engaged in the "reanimation" of the residence in the central part of urban building.

The decree of the CPSU Central Committee, "On measures for providing for implementation of plans on construction of residential houses and social-domestic facilities", reminds us of the necessity of preserving the useful residential fund and actively modernizing it.

What, then, is hindering the serious confrontation of this problem, its implementation not from one case to the next, but systematically, with an in-depth analysis of all the "pros" and "cons"? Capital repair and reconstruction of the available housing is not a simple matter. It requires painstaking work and material and labor expenditures. Sometimes during reconstruction only the outside walls remain from the old house, while the cost of a square meter of residential area is no cheaper than for new construction. Here the use of standard prefabricated products is complicated. It is difficult, some-

times impossible to make use of construction mechanisms to facilitate labor. The output of finished product with such painstaking labor is small -- only several improved apartments. This is why builders, if they do take on the job, only handle the reconstruction of large, four to six-story houses. Here, at least, the result is more significant. But even here, in the former so-called profitable houses, as a rule, various departments are housed after the reconstruction, thus solving their problems in this manner. One-, two- and three-story residential houses with low useful area are not reconstructed at all. (Many of them, long vacated for capital repair, stand for years with their entrances boarded up). Others are simply demolished.

To break down is not to build and certainly not to reconstruct. But is the demolition of an old residence always substantiated? Here are some figures (they were published in the information of Gosgrazhdanstroy at the USSR Gosstroy in the journal ARKHITEKTURA SSSR No 6, 1982): In the years of the 9th and 10th Five-Year Plans an overall area of 31.8 million square meters of residential housing suitable for habitation was demolished, or 4.2 percent of the volume of new construction. These 30 million square meters could have been returned after appropriate repair-reconstruction work in the form of improved residential housing, located for the most part in the center of the city which forms its unique and inimitable, and therefore memorable facade.

In the past decade, of the 120 major, intensively developing cities and in some new cities, for which USSR Central Statistical Administration, took stock, in 45 cities the volume of demolition of habitable housing exceeded the norms by from 1.5 - 3 times. This question has become the subject of a special investigation by the State Committee on Civil Construction and Architecture, which has taken appropriate decisions.

But it is important not only not to demolish the houses, but also to preserve the available housing fund, particularly in historically formed and preserved parts of urban building; not simply to preserve them, but to raise their engineering improvements and comfort to a level which meets modern requirements. And this, as we have noted, is associated with expenditures and is not "paid for" by the high indicators of returned usable area. However, computations show that if this matter is dealt with seriously, in large cities the square area of "reanimated" residential space turns out to be quite significant. However, this requires interest and support from the urban executive committees, their architectural-planning service, builders, party organs, and the general public.

I believe that one of the possible means of realizing plans for low-meter area reconstruction is the involvement of residential-construction cooperatives. Comprising a significant part of the urban residential housing are small houses of the so-called "support" fund (not subject to demolition) with over 50 percent wear. The residents of these houses must move to improved residences, and the buildings must undergo capital repair.

The attraction of personal savings of citizens for the reconstruction of old residential houses in no way contradicts the position of the residential-

construction cooperatives. I am convinced that many people would want to return to the center and live in their old house with all the conveniences. And these conveniences may be created here no less than in new construction. And even with the "exotic" attractions of low-story residential apartments with a garret, with a squeaky staircase, with a cozy fireplace... During reconstruction, the accommodations can be pre-planned according to the needs of the future tenants. The residents will see to the improvement of the lot -- they will plan trees, shrubs, flowers, and cozy gazebos and children's play yards will appear in the yards. And the center will live again. It will be noisy in the mornings with the ringing voices of children, it will be heated on a winter evening by the warmth of bright multi-colored windows.

Of course, in old houses there are many accommodations which do not correspond to modern normative requirements. When they are submitted for reconstruction and capital repair at the expense of residential-construction cooperatives, such accommodations which are unsuitable for residence may be used to house additional auxiliary areas, workshops for artists, sculptors, architects, or semi-underground garages. Today all these needs are being met primarily due to new construction, taking away additional means and materials from the city.

It is very important that residential houses be reconstructed not "piecemeal". but in complex, with the development and concordance of all the necessary project documentation in the established order. The absence of strict architectural control and independent reconstruction are no less harmful and dangerous than the uncontrolled demolition of buildings.

The creation of specialized residential-construction cooperatives proposed here is, of course, not the only real means for preserving and modernizing low-story available residential housing, for "enlivening" urban centers and returning to them their unique coziness and warmth. It is clear that the old house requires our care, for which, I am sure, it will pay us back a hundredfold. And this is to the good of the city as a whole. It will more reliably preserve its specific traits. Personally, I wouldn't mind living in such a house, would you?

12322
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MECHANIZATION OF CONSTRUCTION IN THE FAR NORTH DESCRIBED

Moscow MEKHANIZATSIYA STROITEL'STVA in Russian No 2, Feb 83 pp 11-12

[Article by L. T. Yezerskiy, manager of the Tyumengazmekhanizatsiya Trust: "The Mechanization of Construction Under Northern Conditions"]

[Text] The Tyumengazmekhanizatsiya Trust was a winner in the 1982 All-Union Socialist Competition and was awarded the Challenge Red Banner of the CPSU Central Committee, the USSR Council of Ministers, the AUCCTU and the Komsomol Central Committee. This lofty award was conferred on it for the timely and early fulfillment of the assignments at such most important projects as the Yuzhnyy Balyk and Ilichevskaya petroleum pumping stations, the gas processing plant in Lokosovo and the compressor stations of the Samotlor deposit and at the construction site of apartment houses for the Tyumen petroleum industry workers and construction workers.

The accomplishment of the most important tasks was possible owing to the reorganization of the structure of the trust, the planned improvement of the use of construction equipment, the development of the mobility of sections, the efficient placement of personnel and the technical equipment of the preventive maintenance service.

Having supported the initiative of the leading collectives of Moscow, "60 Shock Weeks for the 60th Anniversary of the USSR," the collective of the Tyumengazmekhanizatsiya Trust completed ahead of time the 1982 state plan, achieved high indicators in the increase of labor productivity and the economical consumption of material, fuel and energy resources and made its own worthy contribution to the production of petroleum and gas in Tyumen Oblast.

A specialized structural subdivision of the Main Territorial Administration for the Construction of Petroleum and Gas Industry Enterprises--the Tyumengazmekhanizatsiya Trust--was created 15 years ago.

Initially there were eight administrations of mechanization, an administration for the supply of complete sets of technological production equipment, an experimental cost accounting section and a section for construction in the trust. After the

reorganization of the trust in 1981 it was necessary in a short time to create a production base in all the administrations of mechanization and to furnish it with a pool of machine tools and auxiliary equipment.

In the North equipment has to operate under difficult natural and climatic conditions. The temperature of the outdoor air is below 0°C 196 days of the year. There are zones of permafrost. During half of the year there are impassable roads on the territory of the trust, therefore the summer is the most intensive period of construction work.

The amounts of work, which is performed by the subdivisions of the trust, are increasing with every year. Whereas a year after its creation the trust performed 4 million m^3 of excavation and earth moving and drove 10,000 piles, in 1981 (after the reorganization) it respectively performed 11 million m^3 of excavation and earth moving and drove 75,000 piles.

Series-produced domestic equipment: E-652B, EO-4121 and E-10011 excavators; D-686, D-687 and DZ-27S bulldozers; K-162, KS-5363 and KS-3562 truck cranes; SP-49 and S-878 pile-driving units; mounted interchangeable equipment for the S-652 excavator was used for the most part for the performance of construction work.

The operation of machines in the North has its own specific nature, and the performance of equipment depends on the extend to which it has been adapted to the conditions.

Some 80-85 percent of the machines are delivered to the construction organizations in conventional design, which considerably decreases their output: the machines do not have means for the preliminary warming of the engines and hydraulic systems; means for maintaining a normal temperature in the cabs, window defrosters; the reliability under the conditions of the North of the A01M engines of the Altayskiy Motor Plant is not high enough; on the machines with hydraulic drive there are no means for shutting off the hydraulic system and releasing the pressure in case of ruptures of hoses and lines. The trust is not equipped with mobile units for the servicing of machines with hydraulic drive.

Caterpillar rippers and chain trenchers of its own make were mainly used for the loosening of the frozen ground.

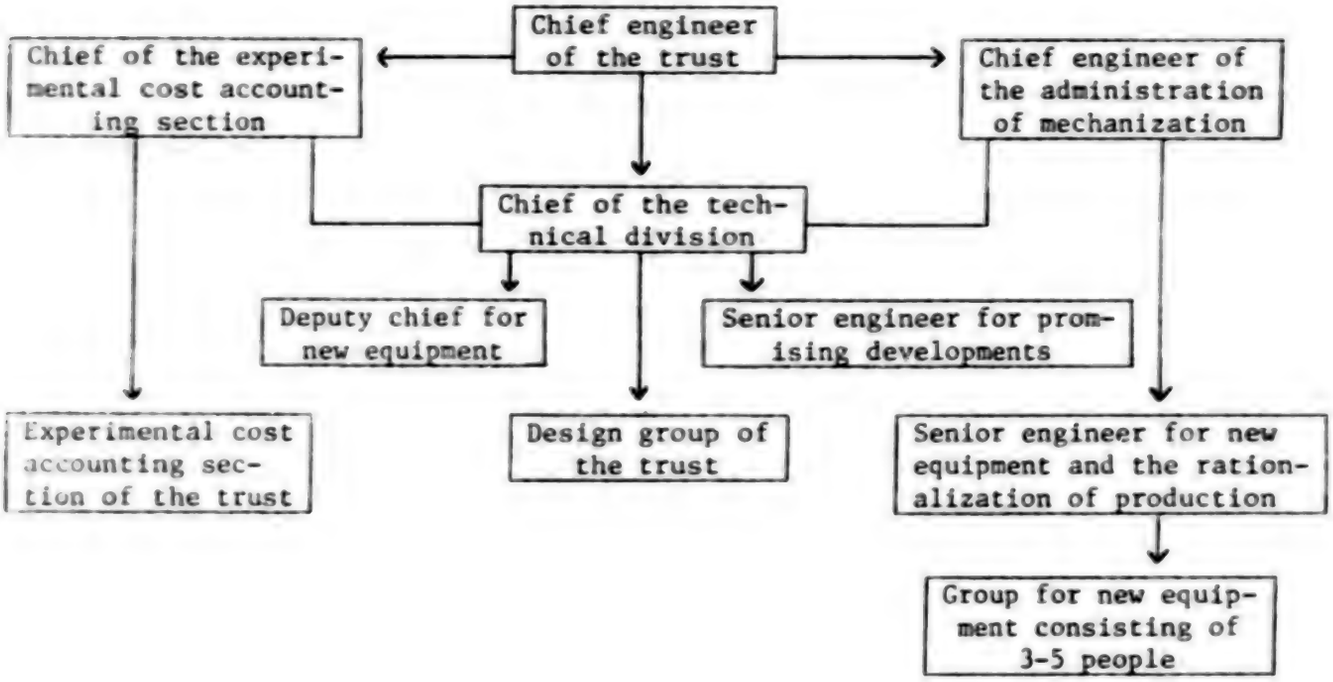
The mounted drilling rigs based on the VVPS 20/11 vibratory pile driver, which were developed at the trust, in practice solved the problem of drilling holes for piles with a depth of 8 m.

Of the units of new equipment pile cutters, BM-1 drilling rigs and a drilling rig based on a T-100M tractor were also developed and produced.

In the past 5 years machines of increased unit power of the foreign firms of Caterpillar, Komatsu, Liebher and Fiat-Allis were used extensively.

Sections specialized according to types of operations, mobile workshops for the servicing of construction machines on the line and repair brigades were organized in the administrations of mechanization for the more efficient use of the machines. The two-shift operation of machines was organized, while in the transportation sections their three-shift operation was organized.

Structure of the Organization of the Service of New Equipment and the Improvement of Production



In addition to technical measures, organs for the monitoring of the state of the maintenance and operation of equipment, which consist of the technical inspectorates of the trust and the administrations of mechanization, as well as services for annual technical inspection, which conduct planned checks and make the appropriate decisions, were envisaged in the structure of the trust.

A service of new equipment, to which the technical division, the design group and the experimental works belong, was organized in the trust for the prompt solution of production problems and the long-range development of production. Questions of mechanization are thus settled at the stage of the drawing up of the technical and design documentation, during the testing of prototypes and their introduction in production.

The experimental cost accounting section of the trust takes up an area of 2,200 m^2 and has 50 units of machine tools for various purposes.

The functions of the section consist not only in the production of new equipment and nonstandard accessories, but also in the adjustment and start-up of this equipment on the line.

The mechanization of construction, as well as the efficient operation of equipment under the conditions of the North require the use of new technological decisions and engineering developments of the working parts of machines, the use of a wide range of mounted interchangeable equipment for a single base machine. For this purpose a service, among the functions of which are the introduction of new

equipment and the use of the advanced know-how of the mechanization of production, was set up in the technical division of the trust, which to a considerable extent contributed to the solution of production problems.

Nearly half (46 percent) of the construction and installation work is being performed by the brigade contract method, 55,630 piles (74 percent) were driven by mechanized multiple-skill brigades, the best of which were the pile-driving brigades of Administration of Mechanization No 3 (Surgut), which are headed by Komsomol Prize Winner and Communist Party Member V. M. Shavilov and his apprentice V. V. Vokal'chuk, who under the difficult conditions drove respectively 13,599 and 14,596 piles. In each brigade there are 20 people, including a geodesist. Two drilling machines, three pipe-laying machines and three pile drivers have been attached to them. All the members of the brigades know related occupations, which made it possible to reduce to a minimum the full-day and intrashift losses. The socialist obligations assumed by the brigades envisage the fulfillment of the 5-year assignment in 3.5 years, in accordance with the initiative of A. D. Basov "Work Without Injuries and Accidents." Much work is being performed in the brigades on the efficient use of equipment and the economical consumption of spare parts, fuel and lubricants. During the year 16 tons of diesel fuel and spare parts worth 1,000 rubles were saved, 4 rationalization proposals with an economic impact of 5,200 rubles were introduced, 2,000 rubles were transferred to the peace fund.

Taking into account the specific nature of work under harsh climatic conditions, the technical services of the trust are attaching particular importance to the development of the standard-unit working capital. For this purpose a special section, which engages in the centralized collection of working capital, the performance of its repair at plants and the exchange of repaired assembly units, was set up in the Administration for the Supply of Complete Sets of Technological Production Equipment of the trust. By means of this in 1981 assembly units worth 408,000 rubles were repaired through the machinery and repair plants of the Ministry of Construction of Petroleum and Gas Industry Enterprises and decentralized channels. For the elimination of the shortage of parts of the running gear of caterpillar machines the trust organized their centralized reconditioning in the experimental cost accounting section, having removed since 1979 the entire stock of parts being received from the circulation of the administrations of mechanization, with the mandatory delivery by them of worn out assembly units. At present more than 2,000 rollers for T-100 and T-130 tractors are being produced in the trust, therefore the administrations of mechanization are not experiencing a shortage of rollers, exchanging the worn out working capital for new working capital at the special section of the Administration for the Supply of Complete Sets of Technological Production Equipment.

At present the trust is producing in accordance with its own developments and the developments of other organizations various nonstandard repair accessories for the mechanization of manual labor in the service and repair of construction equipment in the amount of 100,000-120,000 rubles, which also influences the basic indicators of the performance of machines and the fulfillment of the assignments of basic production.

The combination in the structure of the service of new equipment of units for the elaboration of production problems, pilot testing and production assimilation enabled the trust to solve relatively quickly problems which had previously not been encountered in practice. For example, during the construction of civil and

industrial structures in the permafrost regions of the Urengoy gas deposit they should have used a technology for the thawing of the holes for piles. Since this technology had not been previously used, the corresponding equipment also did not exist. The design group and experimental section of the trust created special gantry cranes and special accessories and jointly with the Moscow State Institute for the Planning of Foundations and Substructures developed this technology, which enabled the trust in a short time to solve the important problem of the construction of complex gas treatment plants and the residential district in Novyy Urengoy.

More than 7,000 piles were driven in accordance with the new technology, which made it possible at Complex Gas Treatment Plant No 1 alone to save 638,000 rubles.

In each subdivision of the trust there is a unit which consists of an engineer for rationalization and invention and a group for new equipment consisting of three to five people and which solves the problems of introducing new equipment.

The rationalizers, who annually submit more than 300 proposals with an economic impact of up to 320,000 rubles, are giving much assistance to production. A mechanized method of stamping the tips of metal piles, which made it possible to increase labor productivity by 15-fold and provided an economic impact of 90,000 rubles a year, was suggested by them. The organized production of interchangeable mounted equipment for base machines made it possible to achieve the efficient utilization of equipment, especially at remote sites. Thus, for example, up to 10 percent of the E-652 excavators are furnished with pile-driving equipment, which they mount in 8 hours.

The trust annually obtains a conditional saving of up to 400,000 rubles from the use of new equipment and the organized output of various nonstandard equipment at the experimental works.

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HIGHLIGHTS OF ALL-UNION CONFERENCE ON CEMENT TECHNOLOGY

Leningrad TSEMENT in Russian No 1, Jan 83 pp 4-7

[Article by M. F. Bukhtin and S. D. Makashev: "The Development of the Cement Industry to a New Level"]

[Text] USSR Deputy Minister of the Construction Materials Industry V. I. Kushchidi, chairman of the Organizing Committee, opened the conference and delivered the introductory report.

The speaker noted that in the CPSU Central Committee Report to the 26th Congress of the Communist Party of the Soviet Union it was stated: "Each sector is faced with its own urgent tasks and specific problems. But there are problems which encompass all spheres of the national economy and the main one of them is to complete the changeover to the primarily intensive path of development."

Such an approach, as was emphasized in subsequent decrees of the CPSU Central Committee and the USSR Council of Ministers, is inconceivable without the improvement of planning, the increase of production efficiency and work quality, the economy and efficient use of raw material, fuel, energy and other material resources.

The workers of the cement industry are making a significant contribution to the accomplishment of the tasks on the development of the national economy. The production of cement as a whole is meeting the needs of capital construction both quantitatively and qualitatively. The role of the workers of the cement industry in the building of territorial production complexes in the European part of the USSR, the Urals, Siberia, Kazakhstan and Tajikistan, in the building of powerful hydroelectric and thermal electric power stations, the Baykal-Amur Railway Line, the Atommash Plant and other structures and in the development of the agro-industrial complex of the country is appreciable.

The material and technical base of the cement industry is being strengthened. During the past five-year plan the fixed capital increased by approximately 500 million rubles.

After dwelling on other production and scientific achievements of the sector, V. I. Kushchidi turned to the statement of the tasks facing scientific research organizations and industrial enterprises.

Thus, recently the Collegium of the USSR Ministry of the Construction Materials Industry adopted a decision on the changeover to the intensive path of development of the dry method of cement production. Therefore the collectives of scientific research and planning organizations, as well as industrial enterprises should prepare more rapidly for the changeover of a number of operating cement plants from the wet method to the dry method.

As a result of the scientific developments, which have been included in the plan of the retooling of enterprises for the 11th Five-Year Plan, it is planned to save about 900,000 tons of conventional fuel and to decrease the consumption of electric power by 2.2 percent. For this purpose it is necessary to implement the following measures: to decrease the moisture content of the slurry being received for roasting; to intensify the heat exchange within the furnaces; to increase the durability of the linings; to use more extensively the heat being radiated by the bodies of the furnaces; to improve the processes of crushing the raw materials. Closer attention should also be devoted to the smoothness of the operation of the set of furnaces, the selection of an efficient composition of the raw material mixture, the perfection of the methods of its adjustment and mixing and the improvement of the granulation of the material being roasted. The implementation of these measures will make it possible to save up to 3 percent of the conventional fuel.

The changeover of a number of enterprises of the wet method to the combined method is one of the important problems. In this connection the work on the study of the filterability of slurries and on the equipment of roasting furnaces with a set of devices for their desiccation is of great importance. For example, the placement into operation of a device for the mechanical desiccation of slurry, which will make it possible during the roasting of clinker to save about 20 percent of the fuel, is envisaged at the Sebryakovskiy Cement Plant. In the future it is proposed also to extend this know-how to other enterprises.

Great reserves in the saving of electric power exist at the stages of the grinding of raw materials and cement. As a result of the more extensive use of rolled armored lining and the increase of the utilization ratio of ground aggregates it is possible to decrease the consumption of electric power by 5-10 percent.

At the enterprises the optimum loading of the mills with an efficient layout of the chambers and the installation of classifiers, as well as self-grinding mills must be introduced more extensively, core loading must be used and more attention must be devoted to the closed cycle of the grinding of cement. In this respect the example of the Olshanskiy Plant, where for several years now the grinding of cement has been carried out according to a two-flow arrangement, which promotes a decrease of the consumption of electric power by 10-15 percent, is significant.

While speaking about the economy of raw material, fuel and energy resources, as well as about the improvement of the ecological balance of the country, the speaker directed attention to questions of the efficient use in the cement industry of natural materials, industrial waste products and byproducts, having distinguished three basic directions of their use:

as a component of the raw material mixture, which makes it possible to save natural resources, to improve the chemical and mineralogical composition of the clinker and by means of this to improve product quality, and in a number of instances to reduce the moisture content of the slurry by 2-3 percent;

as an active mineral additive when producing multicomponent (blended) cements, which is most important;

in place of natural gypsum stone without the worsening of the properties of the cement, for which chemical gypsums are suitable.

It has been demonstrated by the work experience of a number of enterprises that the feeding of furnaces from the cold end with slags, ashes and other materials makes it possible without a substantial change of the technology to decrease the consumption of fuel for the roasting of clinker by up to 15 percent with the simultaneous increase of the capacity of the furnaces. Thus, the use of ashes, for example, at the Slantsy Plant decreased the need for limestone and reduced the consumption of fuel for the roasting of clinker, at the Navoi Plant it improved the operating conditions of the furnaces, at the Timlyuyskiy Plant, the Kant and Balakleya Combines and several other enterprises it yielded good results as a correcting additive.

However, in our country the possibility of replacing moisture-retaining clays and marls with the ash and cinder waste of thermal electric power stations has not been studied at all, although this question remains a most important problem for the Amvrosiyevka and Akhangaran Combines, the Shchurovskiy and many other plants.

The work on the use as a raw material component of the waste products of coal dressing, which contain up to 15-20 percent fuel, is being expanded extremely slowly. This question is especially urgent for the cement plants of the Ukraine, Kazakhstan, Western and Eastern Siberia.

A significant sphere of activity for science is the further improvement of the production technology and the utilization of multicomponent cements, as well as the use of active mineral additives, which provide the national economy with an enormous saving. Here it is also significant that when using blended cements the saving of fuel is followed up to the production of concrete items.

For the national economy of the country it is important for all enterprises to use additives in the maximum amount permitted by the standards. Here it is necessary to organize the matter so that local, and not imported materials would mainly be used, since as a result of their transportation the Portland furnace slag cement at some enterprises in its production cost is almost as good as Portland cement.

It is also necessary to enlarge further the assortment of waste products being used, by utilizing the slags of nonferrous metallurgy and steel founding slags, the overburden rock of the mining industry, the ashes and cinders of thermal electric power stations, as well as natural volcanic rock and others. Apparently, for the acceleration of this work assignments on the search for local additives for specific plants should be formulated for institutes, while the plants should be obliged to introduce more rapidly and more efficiently the proposals and developments of the institutes. The proposals on the elimination in the standards of the excessively strict restrictions on the material composition of cements must also be studied. This especially applies to cements of brand 300.

One of the reasons for the poor utilization of waste products is their low quality. Electrothermal phosphorus slags with an increased content of phosphorus, the belite sludge of the Achinsk Alumina Combine with a large amount of alkalies and others can serve as an example.

It is obvious that the obtaining of waste products and byproducts in a form, which is convenient for subsequent processing at enterprises of the cement industry, is an important intersectorial problem, for the solution of which a uniform goal program is necessary.

At present such a program has been drafted in the sector. However, it does not envisage to a sufficient extent the participation of institutes and enterprises of related sectors in its implementation. It is necessary to set for them the goal to turn over waste products in an agglomerated, granulated or powdered form, as well as to increase their quality.

The ultimate goal of the program should also be defined concretely: to increase the consumption of secondary raw materials in the sector to 36-38 million tons in 1985 and to 43-45 million tons in 1990.

It is necessary to work more intensively on the development of new efficient types of cement, directing attention to noncritical natural and secondary resources. Thus, the development of an industrial processing method of self-stressing cement is an important national economic task. It is possible to use the ash and slags of nonferrous metallurgy as a raw material for the production of such cement. With allowance made for the saving of reinforcing steel in reinforced concrete components based on this cement and the decrease of the heat expenditures on the production of sulfo-aluminate clinker, the total energy expenditures can be reduced by 600-700 kcal/kg of cement.

Further V. I. Kushchidi stressed that at present no field of science or sector of production can be developed in isolation of the others. Only the extensive comprehensive solution of problems can lead to success. Therefore, the development of scientific and technical goal programs, in which not only the purely technical questions, but also the questions of an economic nature, of material and technical supply, the efficient use of transportation and environmental protection should be indicated, is acquiring particular importance. Here the trends of the development of the national economy for the future should also be taken into account. In short, the programs should be balanced in all respects. And so that these programs would be fulfilled, the related industries should observe the obligations assumed by them both with respect to the timely solution of scientific and technical problems and with respect to the supply of the cement industry with high quality raw materials, components and other materials.

In conclusion the speaker expressed confidence that the tasks, which are set for the cement industry in the Basic Directions of National Economic Development for 1981-1985 and the Period to 1990, will be successfully accomplished by the efforts of the workers of science and production.

Hero of Socialist Labor, Academician N. M. Zhavoronkov greeted the participants and guests of the conference on behalf of the Presidium of the USSR Academy of Sciences. In his speech he also posed the task of the complete processing of nepheline ores, which will ensure the more efficient production of alumina, soda and cement, and of the closer cooperation of the workers of academic and sectorial institutes in the area of research.

Scholars, executives and scientists of sectorial institutes, specialized chairs of higher educational institutions and other organizations delivered reports at the plenary sessions.

In his report Academician M. M. Shul'ts (Institute of the Chemistry of Silicates of the USSR Academy of Sciences) covered the modern methods of physicochemical studies of silicates and silicate systems, which are of interest for the chemistry and technology of cement.

The main task of such studies, the speaker said, is the development on the basis of their results of new types of materials and the improvement of the production technology of binders.

Further M. M. Shul'ts described the methods of research, which are presently being used in our country and abroad: X-ray diffraction; X-ray spectral microanalysis; electron microscopy; transmitting, superhigh-voltage and high-temperature microscopy; oscillatory spectroscopy; radioscopy; ionometry; X-ray electron spectroscopy.

The speaker reported that at the Institute of the Chemistry of Silicates the composition of the phases of Portland cement and alinite clinkers, as well as the clinkers of white cements before and after bleaching was studied by A. I. Boykova with staff members using a Kamebaks unit. The obtained results not only provided information on the quantitative chemical composition of the minerals in clinkers meant for different purposes, but are also making it possible to draw conclusions about the crystal chemical peculiarities of the structure of their minerals, the originality of the isomorphism in them and the prevalence of impurities in the crystal lattices of minerals.

Thus, M. M. Shul'ts concluded, the potentials of modern methods of the physicochemical studies of cements are very great and diverse. It is necessary merely to strive for the substantial expansion of the production of the most perfect instruments and devices.

Corresponding Member of the Georgian SSR Academy of Sciences O. P. Mchedlov-Petrosyan (State Institute for the Planning of Cement Plants in the Southern Regions of the USSR) examined the questions of the improvement of the technology of cement production, having emphasized that in this respect three problems at present are most urgent for scientific organizations and industrial enterprises: the decrease of the energy expenditures on the production of cement; the increase of its quality and strength; the use of technogenic products or new types of raw materials with the development in so doing of waste-free technological processes.

The new method of roasting, which was developed by the State Institute for the Planning of Cement Plants in the Southern Regions of the USSR with the participation of the State All-Union Scientific Research Institute of the Cement Industry and envisages the decarbonization of the material in suspension in the working volume of a rotary furnace with the combustion of process fuel in its feed and discharge ends, the speaker further said, is a promising and new direction. Here the conditions are created for the decrease of the specific expenditures of heat and the quite precise regulation of the temperature level in the roasting process. The conducted semi-commercial tests showed that the obtained products of roasting contain minerals of a high activity, which make it possible to produce fast-hardening cements with a number of interesting civil engineering properties.

In the scientific developments of recent times, O. P. Mchedlov-Petrosyan noted in conclusion, suggestions on the use of small additives have been encountered more and more frequently. Both additives, which give cements specific properties, and blended cements based on new combinations of components belong here. All these varieties of cements for the present are being used little in practice, but further study will inevitably promote their gradual introduction in everyday practice.

Doctor of Technical Sciences I. V. Kravchenko (All-Union Institute for the Increase of the Skills of Managers and Specialists of the Construction Materials Industry) told about the technological modification of the clinkers of special cements, which makes it possible to change under control their physical, mechanical and chemical properties, as well as to regulate the technical characteristics (see TSEMENT, No 9, 1982).

Owing to this method, extra fast-hardening cement based on sulfo-aluminate clinker, as well as expanding and self-stressing cements were obtained at the State All-Union Scientific Research Institute of the Cement Industry.

An efficient and practicable direction, I. V. Kravchenko noted, which ensures the increase of the capacity of furnaces and a decrease of the specific expenditures of heat on roasting, is the method of their additional feeding with materials, which do not require significant heat expenditures on preparation for the reactions of clinker formation, which are fed into the preparatory zone of the furnace. The by-products of a number of workers, which contain low-base silicates, aluminates and calcium aluminoferrites: nepheline sludge, blast furnace and electrothermal phosphorus slags, the ashes of thermal electric power stations and so on, are among such materials.

As a result of extensive industrial testing of the additional feeding of furnaces with the indicated materials the possibility of increasing their capacity by 20-25 percent and of decreasing the specific consumption of heat for the roasting of clinker by up to 20 percent was established.

Baryta-containing clinkers (4-15 percent BaO) were synthesized on the basis of the waste products of lithopone production under the conditions of a pilot plant of the State All-Union Scientific Research Institute of the Cement Industry. As a result of this the industrial production of high sulfate-resistant baryta-containing Portland cement with the use of such waste products as a raw material component was carried out at a number of plants. It is recommended to use this cement for the production of concrete and reinforced concrete components made from concrete of increased density or very dense concrete, which operate without the protection of their surface under the conditions of sulfate or sulfate-magnesia attack.

Thus, I. V. Kravchenko stated, the thermochemical modification of the basic clinker phases when using technogenic products makes it possible not only to change the technical properties of cement in the necessary direction, but also to solve an important ecological problem with a significant economic and technical impact.

Corresponding Member of the Ukrainian SSR Academy of Sciences A. A. Pashchenko (Kiev Polytechnical Institute) devoted his report to questions of the expansion of the raw material base of cement production. After dwelling on the optimum properties of the raw materials, which are necessary for the obtaining of high quality cement, and the effects of various additives on these properties, the speaker noted

that the use as an aluminosilicate component of the raw material mixture of volcanic rocks--basalt and perlite, which are noted for a low natural moisture content--is an alternate solution, which makes it possible to use extensively the dry method of cement production, regardless of the climatic zone and season of the year.

Basalt cements are noted for a high compression strength (65 MPa and more) and bending strength, which it is possible to explain by the development in the hardening system of fibrous forms of hydrates. They also have other valuable properties and can be used as general construction, sulfate-resistant and grouting binders (see TSEMENT, No 3, 1982).

Perlites, which have a low moisture content (up to 6 percent) and are suitable for obtaining cement by the wet method, also yield good results. Portland cement of brand 550 with a silicate modulus of 4.5 was obtained on the basis of perlites under pilot industrial conditions. The concretes based on such cements, along with greater strength, have greater stability in corrosive mediums and durability.

The experiments conducted by us, A. A. Pashchenko said in conclusion, showed that basalt and perlite, wherever the raw material base exists, can be used both at new plants and in the case of the changeover of operating plants from the wet method to the dry method.

Doctor of Technical Sciences S. V. Shestoperov (Moscow Institute of Automobile Roads) dwelled on the role of classifying in the decrease of the consumption of cement in concrete, which makes it possible to determine quantitatively the same properties for cements of different plants for the purpose of identifying the factors, which give rise to their changes, and, in the end, to solve the problems arising here, for example, to adjust some properties of a binder or others.

The work, which is being performed at the institute on the classifying of the products of plants and was endorsed by the USSR Ministry of the Construction Materials Industry and the USSR Ministry of Higher and Secondary Specialized Educational Institutions, is of great national economic importance, since it will promote the decrease of the content of cement in various concretes, the increase of their quality and durability and the decrease of the materials-output ratio of components.

Candidate of Technical Sciences A. P. Osokin (Moscow Institute of Chemical Technology imeni D. I. Mendeleyev) covered the general theoretical principles of the chemistry of clinker (see TSEMENT, No 9, 1982).

Doctor of Technical Sciences M. M. Sychev (Leningrad Technological Institute imeni Lensoveta) examined the chemical aspects of the processes of the hardening of cements (see TSEMENT, Nos 8 and 9, 1982).

Candidate of Technical Sciences A. M. Dmitriyev (director of the State All-Union Scientific Research Institute of the Cement Industry) told about the new types of special cements, which had been developed at the institute, and the prospects of the development of their production (see TSEMENT, No 9, 1982).

Engineer N. F. Ananenko (director of the State Planning Institute of the Cement Industry) described the basic directions of the changeover of cement plants from the

wet method to the dry, semidry and combined methods, on which the collective of the institute is working.

Candidate of Technical Sciences I. F. Ponomarev (director of the State Institute for the Planning of Cement Plants in the Southern Regions of the USSR) analyzed the means of saving fuel and energy resources in the case of the wet method of production, which were developed at the institute.

State Prize Winner and Doctor of Technical Sciences A. V. Volzhenskiy (Moscow Institute of Construction Engineering) reported on new, efficient types of fast-hardening cements and concretes, the technology of which was developed at the institute and to which the USSR Ministry of the Construction Materials Industry should direct attention.

A. M. Dmitriyev, director of the coordinating center, gave an information report on the cooperation of the CEMA member countries in the area of the chemistry and technology of cement.

At the conference three round tables worked on the problems:

1. "The Physicochemical Principles of the Formation of the Structure and Properties of Clinkers and Cements" (O. P. Mchedlov-Petrosayn, chairman; T. V. Kuznetsova, deputy chairman; B. S. Al'bats, academic secretary).

2. "The Intensification of Technological Processes" (A. M. Dmitriyev, chairman; Ye. G. Drevitskiy, deputy chairman; V. K. Khokhlov, academic secretary).

3. "The Means of Saving Fuel and Energy Resources in the Production of Cement" (A. S. Boldyrev, chairman; V. M. Belogurov, deputy chairman; Z. B. Entin, academic secretary).

More than 600 people took part in the discussion of these problems and the debates on them.

From the delegations of the socialists countries Candidate of Technical Sciences P. Volkov (Bulgaria), Professor J. Talaber (Hungary), Doctor W. Kruger (GDR), Doctor J. Gradsky (CSSR), Doctor S. Duda (Poland), Candidate of Chemical Sciences L. Apoczi (Hungary), Professor W. Kudrowski (Poland), Candidate of Technical Sciences L. Gigova (Bulgaria) and others spoke at the conference.

Popular science movies: on the production technology of decorative cements; on the recovery of the heat radiated by the bodies of rotating furnaces; on the dry method of cement production, were shown to the conference participants.

On behalf of the delegations of the socialist countries Professor J. Talaber expressed gratitude to the organizers of the conference and to the Soviet cement scientists for the invitation to the conference, the cordial reception and the meaningful reports.

Member of the Collegium of the USSR Ministry of the Construction Materials Industry and Chief of the Main Administration of the Cement Industry for Western Regions V. M. Belogurov summarized the work of the conference.

The conference participants adopted recommendations in which the following is recorded.

1. The institutes of the USSR Academy of Sciences and the academies of sciences of the union republics, the chairs of higher educational institutions jointly with sectorial scientific research and planning institutes are to extend the basic theoretical and applied research in the area of the chemistry and technology of cement and the development of new low-energy-consuming processes and types of cement, including with the use of catalytic and modifying agents, industrial waste products and byproducts; to develop the studies of the mechanism of the setting and hardening of binding systems on the basis of different material compositions and at different stages; to devote particular attention to the processes of mineral formation during the roasting of nontraditional raw material mixtures (on the basis of waste products and new types of raw materials).

2. The sectorial scientific research institutes of the cement industry are to:

intensify the research on the use in the cement industry of waste products and products, which contribute to the decrease of the fuel, energy and other material expenditures;

give effective scientific and technical assistance in the area of the intensification of technological processses, the economy of material and manpower resources: first of all on the improvement of the grindability of raw materials; the improvement of the systems of the blending and adjustment of the raw material mixture; the decrease of the moisture content of the slurry; the furnishing of the rotary furnaces with efficient heat-exchange and burner units and the grinding units with efficient classifying units, an armored lining and an efficient grinding load; the use of catalytic and modifying agents; the elaboration of the optimum operating conditions of the basic technological equipment; the increase of the degree of the mechanization and automation of labor-consuming processes (the Karachayevo-Cherkess, Topki, Ust-Kamenogorsk, Vorkuta, Chechen-Ingush, Chernorechenskiy, Gornozavodsk, Chimkent, Magnitogorsk, Shchurovskiy and Dneprodzerzhinsk Plants; the Bryansktsement Production Association; the Novorostsement, Angarsk, Rybnitsa, Zdolbunov and Bekabad Combines);

complete for the most part the development and turn over to industrial production the technology of the obtaining of alinite cement, besalite and crents, the more complete utilization of the belite sludges of the Achinsk Alumina Combine;

VNIIESM [All Union Scientific Research Institute for Economics of the Construction Materials Industry] is to promote more extensively the experience of the leading enterprises, which have achieved a high level of standards and economics of the production of cement.

3. The sectorial institutes and industrial enterprises are to:

direct the main efforts at the acceleration of the introduction in industry of technical decisions on the improvement of the technology of cement in conformity with the scientific and technical comprehensive goal programs, including to elaborate and introduce methods of the improvement of the technology and equipment for the wet method of the production of cement for the purpose of decreasing the consumption of fuel for the roasting of clinker with the simultaneous increase of

product quality and the capacity of the furnaces at the Spassktsement and Karagandatsement Production Associations; at the Navoi, Lipetsk, Pervomaysk, Bezmein, Katav-Ivanovsk and Krivoy Rog Plants, at the Rybnitsa Combine;

develop and assimilate an improved technology of the preparation of slurry in powerful self-grinding mills, which ensures the constancy of the chemical composition and the decrease of the moisture content of the slurry, the processing of soft (with inclusions which are hard to grind), as well as solid raw materials and makes it possible to decrease the energy expenditures by 5-10 percent (the Bryansktsement Production Association; the Novorostsement and Angarsk Combines; the Shchurovskiy, Ust-Kamenogorsk, Chechen-Ingush, Magnitogorsk, Novotroitsk, Nizhniy Tagil, Gornozavodsk, Korkino, Karachayevo-Cherkess and Savino Plants);

develop and introduce an improved technology and equipment for the wet method of cement production for the purpose of decreasing the consumption of fuel for roasting to 1,300-1,400 kcal/kg of clinker and increasing its quality, as well as the capacity of the furnaces by the decrease of the moisture content of the slurry with the introduction of liquifiers, the additional feeding of the furnaces with the waste products of other sectors of industry, the installation of built-in decarbonizing reaction vessels, the increase of the stability of the lining (the Amvrosiyevka, Akhangaran and Zhigulevsk Combines; the Kramatorsk, Ust-Kamenogorsk, Chimkent, Olshanskiy, Shchurovskiy and Kamenets-Podolskiy Plants);

develop and introduce technological processes of the grinding of clinker and additives on the basis of the complete modernization of cement mills, the use of stage-flow layouts of the closed cycle, new efficient intensifiers of grinding, as well as automated control systems, which ensure a decrease of the electric, material and manpower expenditures by 5-10 percent and an increase of the output of high-strength and blended cements (the Olshanskiy, Punane Kunda, Ust-Kamenogorsk, Novotroitsk and Shchurovskiy Plants; the Amvrosiyevka and Angarsk Combines; the Bryansktsement, Akmyantsement and Mordovtsement Production Associations);

elaborate and implement measures, which are aimed at the further increase of the activity of cement, the improvement of the product quality control systems, the assurance of the fulfillment of the assignments on the production of cement of the highest quality category;

introduce more extensively modern methods of study and monitoring, extend the use of petrographic and X-ray spectral methods of analysis when monitoring the quality of raw materials and clinker;

for the purposes of improving environmental protection, expand the work on the further reduction of technological discharges of harmful substances and the improvement of the cleaning of exhaust gases, as well as on the reclamation of trapped dust.

4. The State All-Union Scientific Research Institute of the Cement Industry as the main scientific research institute of the cement industry jointly with the All-Union State Scientific Research and Planning Industry of the Cement Industry, the State Institute for the Planning of Cement Plants in the Southern Regions of the USSR, the SibNIIproyekttsement [Siberian Scientific Research Institute for the Design of Cement Industry Enterprises] and the All-Union Special Office for Start-Up, adjustment, Planning and Design Work in the Cement Industry,

as well as with other scientific developing organizations are to select for introduction in production the most effective completed scientific developments and to give cement enterprises assistance in their quickest possible introduction.

5. The USSR Ministry of the Construction Materials Industry is to consider the question of the further development of the pilot experimental bases of the sectorial scientific research institutes and the provision of scientific and plant laboratories with modern equipment and instruments.

6. The scientific research institutes jointly with the main administrations of the cement industry and the ministries of the construction materials industry of the union republics are to organize the training of engineering and technical personnel and workers of the leading occupations directly at the enterprises for the purpose of studying advanced know-how and the latest achievements in the area of the chemistry and technology of cement.

7. The Main Administration of the Cement Industry for Western Regions and the Main Administration of the Cement Industry for Eastern Regions, the ministries of the construction materials industry of the union republics and the enterprises of the cement industry are to aim the organizational and mass political work and the socialist competition of the collectives of workers at the fulfillment of the annual plan assignments of the 11th Five-Year Plan; at the economy of material, fuel and energy resources, at the decrease of the labor-output ratio and the increase of labor productivity.

The participants in the Sixth All-Union Scientific and Technical Conference on the Chemistry and Technology of Cement appealed to all the scientists and engineering and technical personnel, to the workers of the cement industry and to the scholars of the institutes of the USSR Academy of Sciences and the academies of sciences of the union republics, as well as the chairs of higher educational institutions to display creative initiative and persistence and to concentrate all their efforts, experience and knowledge on the accomplishment of the tasks, which were posed by the 26th CPSU Congress, on the acceleration of scientific and technical progress in cement production, the increase of its efficiency, the fulfillment of the state plan of the 11th Five-Year Plan and the implementation of the USSR Food Program.

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BUILDING MATERIALS INDUSTRY'S LAG DEPLORED

Moscow STROITEL'NAYA GAZETA in Russian 2 Mar 83 p 1

/Article: "To Accelerate the Erection of Installations At a Base"/

/Text/ For this current five-year plan, the construction materials industry has been assigned important tasks concerned with increasing the production of progressive products based upon the latest achievements of scientific-technical progress. This requires the building of modern enterprises and technological complexes and the modernization of existing production efforts.

This program is being carried out in a persistent manner. Last year alone, capabilities were placed in operation for producing 1.8 million tons of cement at the Krivoy Rog Cement Plant and the Nikolayev Cement-Mining Combine and for 120,000 heating boiler UKM's at the Karaganda Heating Equipment Plant. Brick plants which operate completely on the basis of imported equipment were accepted by worker committees in Livny, Khabarovsk and so forth.

Nevertheless, just as in the past, the rates and volumes for capital construction in the construction materials industry do not correspond to the level called for in the tasks for the five-year plan. Of 64 important production capabilities, only 41 were placed in operation in 1982. In particular, the program at the RSFSR Minstroymaterialy /Ministry of Construction Materials/ was carried out in a very unsatisfactory manner; here only 14 of 31 projects were turned over for operation. The tasks for placing projects in operation were also disrupted in the ministries for the Azerbaijan, Armenian and Turkmen SSR's, Glavzapadtsement /Main Administration of the Cement Industry of the Western Regions/, Glavnemetallorud /Main Administration for the Non-Metallic Mining Industry/ and Glavzhelezobeton /Main Administration for the Manufacture of Reinforced Concrete Parts and Structures/.

Included among those production efforts which have not been placed in operation and which are considered to be of priority importance for development of the branch -- capabilities at the Savino Cement, Londoko Limestone and Vozzhayevskiy Brick Plants.

The construction of enterprises of the brick industry is being carried out very slowly. Last year's tasks for these installations were fulfilled by only 65 percent. As a result, the builders were undersupplied to the tune of one

half billion bricks. The resources allocated for erecting limestone plants are being utilized in a completely unsatisfactory manner -- only 54 percent of the investments.

Somewhat bewildering is the position being taken by those construction ministries which are experiencing shortages in cement, bricks and other construction materials. They frequently register complaints regarding the quality of the products and yet they constantly "forget" their own obligations with regard to erecting the installations of a base.

Last year not one construction ministry fulfilled its plan for housing construction at enterprises of the RSFSR Minstroymaterialy. These installations were erected in an unsatisfactory manner by USSR Mintyazhstroy /Ministry of Construction of Heavy Industry Establishments/, USSR Minstroy /Ministry of Construction/, USSR Minpromstroy /Ministry of Industrial Construction/ and other ministries.

As emphasized in the decree of the CPSU Central Committee entitled "Measures for Ensuring the Fulfillment of Plans for the Construction of Housing and Social-Domestic Installations," the ministries and departments must change radically their attitude towards housing and civil construction. A complex of measures must be developed and implemented this year for ensuring the placing in operation of housing and social projects, in the volumes planned and on schedule.

Unfortunately, in addition to the contractual organizations the clients are also guilty of allowing disruptions to take place in the construction of the more important underway projects. They are solving on an untimely basis such problems as equipment deliveries, the carrying out of start-up adjustment work and staffing the units with operational personnel and they are not defining in an accurate or timely manner the estimated costs of construction. Owing to mistakes and a passive attitude by the client services at the Savino Cement Plant, the second Gidrofol mill was delivered in October of 1982 instead of during the second quarter. The front of work for the installations organizations, for converting the raw material mills over to the milling of cement, was presented 3-4 months late.

Delays in accepting a number of capabilities built in recent years have caused considerable harm to the work. Owing to mistakes in the selection of technological equipment, the untimely training of operations personnel and other client shortcomings, in 1975 the documents for the state acceptance committees were not formulated at the Kokchetav Coaline Combine, in 1976 -- at the Ryazan Cardboard and Ruberoid Plant, in 1981 -- at wall materials plants in Tobolsk and Vinzilyakh and in 1980 -- at the Ashkhabad Glass Combine and others.

All of these shortcomings led to a situation wherein the plan for capital investments at USSR Minstroymaterialy was fulfilled by 85 percent and for construction-installation work -- by 81 percent. The tasks for erecting installations using the economic method and internal contractual organizations were not fulfilled -- at the construction materials ministries for the RSFSR, BSSR and the Kazakh and Moldavian SSR's and at the Polimerstroymaterialy NPO /Scientific Production Association/.

At the present time, a task of priority importance confronting the subunits of USSR Minstroymaterialy is that of accelerating the elimination of past mistakes so as to make available the resources required for implementing the plan for 1983. And the program that has been formed is a tense one.

The branch's collectives have vowed to place in operation, by 1 May, capabilities for producing 70 million jars for children's food at the Ordzhonikidze Glass Plant and by the 66th anniversary of October -- a production capability for 200,000 EKM steel convectors at the Moscow Cast Iron Foundry. They have also vowed to place in operation technological complexes for 30 million units of facing brick at the Kazan Plant for Silicate Wall Materials, for 100,000 tons of lime at the Kolyadichi Plant and for 22,500 cubic meters of reinforced concrete products at the Kavkazskiy Plant for Reinforced Concrete Sleepers.

In carrying out the measures called for in the plan for the social-economic development of collectives, it will be necessary in 1983 to place in operation 751,000 square meters of housing space and accommodations for 1,900 at children's pre-school institutes and for 1,920 at professional technical schools.

The republic ministries, main administrations, administrations and associations must devote a great amount of effort towards eliminating last year's mistakes and such that they will be able to cope with this year's tasks. Jointly with the contractual organizations, the development of complex schedules for construction-installation work for underway projects and the more important carry-over construction projects must be completed as rapidly as possible. The underway complexes and the internal building title lists in accordance with the results for 1982 must be defined more precisely and the schedules for the delivery of equipment for underway projects must be coordinated with Soyuzglavstroykomplekt /Main Administration for Ensuring the Supply of Complete Sets of Equipment, Instruments, Cables and Other Products for High-Priority Consruction Projects of the Building Materials and Construction Industries/ and with the territorial organs of USSR Gossnab. Constant control must be organized over the course of erecting installations in the interest of ensuring efficient solutions for all problems which might arise.

Since reductions in the operation of the construction production line often occur at the junctions where the contractual and sub-contractual organizations, clients and suppliers come together, the chief task of the economic leaders and the active membership of the professional trade union and other social organizations is that of making extensive use of the tested and proven means and methods for coordinating the efforts of all those participating in construction projects and motivating them to achieve high final results.

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COMPUTERS AID IN CEMENT CONSERVATION

Moscow BETON I ZHELEZOBETON in Russian No 2, Feb 83 pp 6-7

[Article by Candidate of Technical Sciences V. V. Tsyro, the Stroyindustriya Special Design and Technological Bureau of the USSR Ministry of Construction (Kalinin), and engineers V. A. Merkulov and V. I. Trubnikov, the Penza Affiliate of the Stroyindustriya Special Design and Technological Bureau: "The Introduction of Automated Control Systems Is One of the Means of Saving Cement"]

[Text] The introduction of automated control systems of construction work in the USSR Ministry of Construction has been under way for quite a long time. Definite results have been achieved in this area: the efficiency of management and administration is increasing, the duration of construction is decreasing, the idle times are being shortened, the supply of complete sets of equipment is improving and so on.

The Stroyindustriya Special Design and Technological Bureau of the USSR Ministry of Construction is carrying out the development and introduction of automated control systems of house building combines.

The program entitled "Concrete" is among the developed and introduced sets of automated control systems of house building combines. With the use of modern computer equipment it ensures in the shortest possible time the selection of the formula of the concrete mix with the minimum consumption of cement, which also makes it possible to obtain a considerable saving of this valuable material.

The basic mathematical model of this problem was elaborated by the Scientific Research Institute of Concrete and Reinforced Concrete on the basis of the multifunctional dependences of the consistency of the mix and the strength of the concrete on the activity of the cement, the water-to-cement ratio, the fineness modulus of the sand, the normal consistency of the slurry and the consumption of crushed stone. Specialists of the Design and Technological Bureau of the USSR Ministry of Construction modified the problem slightly as applied to specific operating conditions with the use of an M-6000 process control computer complex, with which 12 house building combines of the ministries are equipped with today.

The basic goal of the "Concrete" program is the output of working formulas of heavy concrete mixes of various mobilities and brands, which do not require experimental checking under laboratory conditions and guarantee the obtaining of concrete of the

desired strength with the minimum consumption of cement and the optimum ratio of the fine and coarse aggregates.

The traditional methods of testing materials and selecting the formulas of concrete mixes on the basis of the prevailing All-Union State Standards are very protracted. The results of the choice of formulas very often enter production after the materials, for which the choice was made, have already been used up, while the existing methods do not provide for adjustments of the formulas subject to the change of the indicators of the quality of the materials.

Most often such a situation forms with the cement, for which there are practically not reliable express methods of determining the basic technical characteristics. In practice it is nearly impossible by rapid means to determine the entire range of the necessary technical parameters of the fine and coarse aggregates.

Such indicators of the quality of the materials as the fineness modulus of the sand, the contamination of the aggregates, the normal consistency of the slurry, the bulk density of the coarse aggregate, the moisture content of the aggregates and so on have a substantial influence on their ratio in the mix and the consumption of cement. However, the workers of construction laboratories, while determining daily the values of these parameters, as a rule, do not adjust, and at times do not have the opportunity to change the formulas of the concrete mixes subject to the indicators of the components.

In order to be certain of obtaining concrete of the desired strength, at the laboratories, as a rule, they overstate the consumption of cement, without making adjustments of the coarse and fine aggregates, which very often leads to a significant actual overconsumption of the binder.

By using an M-6000 process control computer complex (minicomputer), on the basis of the basic passport data they carry out in a matter of minutes the calculation and adjustment of the formula of the concrete mix of the required brand subject to the properties of the source materials.

The concrete mix, which was produced in accordance with the recommendations of the M-6000 process control computer complex, was repeatedly subjected to tests under laboratory and production conditions. The tests confirmed the correctness of the computer method of selecting the formula of the concrete mix.

Since 1980 a reliable and efficient system of selecting the formula of concrete by means of computer has been adopted at seven house building combines of the USSR Ministry of Construction, which are equipped with M-6000 process control computer complexes and have automated control system divisions (in Barnaul, Ulyanovsk, Penza, Kalinin, Novosibirsk, Tambov and Kirov). The introduction of the "Concrete" automated control system with the use of an M-6000 process control minicomputer at house building combines provides an economic impact in the amount of about 340,000 rubles, the enterprises save in a year about 19,000 tons of cement.

Taking into account the importance of the problem of the economy of resources in construction work and to execute the decree of the CPSU Central Committee and the USSR Council of Ministers on the tightening up of the economy and efficient use of all types of resources, the Penza Affiliate of the Stroyindustriya Special Design

and Technological Bureau continued and intensified the work on the mechanization of the analysis of the concrete mix.

The "Concrete" program at the majority of plants of the construction industry has a limited sphere of use due to the lack of special computer equipment, therefore its tabular version was developed for the rapid calculation without a computer of the formula of the concrete mix, which is a kind of modified version of the "Concrete" problem and allows its mass dissemination.

The many years of statistics of the indicators of the quality of the raw materials, which were recieved by enterprises, were the basis for the elaboration of the tabular version of the "Concrete" program. The mean statistical values of each indicator, which substantially influence the formula of the concrete mix and the consumption of cement, as well as the limits of the variation of each indicator (the minimum and maximum values) were selected in accordance with the results of the processing on a computer of the statistics of the indicators of the quality of the materials.

For the mean statistical values of these indicators they calculated on an M-6000 process control computer complex the starting formulas for the entire product list of the given enterprise and presented them in the form of tables.

In the tables, which are turned out by the computer printer, the basic characteristices of the components of the concrete mix are initially printed: cement (density, activity, normal consistency), crushed stone (density, bulk density, contamination, moisture content, brand, water absorption, largest grain size, type of rock and others), sand (density, bulk density, contamination, moisture content, fineness modulus and others). Moreover, the brand of ordered cement, the mobility, type, tempering strength and so forth are indicated.

The working formula of the concrete mix on the basis of the result of the calculations on the computer is issued for a specific brand of concrete and its mobility in terms of 1 m^2 and a single batch. The table of the working formula in both versions consists of the following indicators: cement (kg), crushed stone (kg) and water (l). Moreover, the computer prints out the density of the concrete mix, as well as the excessive consumption of cement subject to the contamination of the aggregate--sand or crushed stone. The coefficients for the initial formulas of the concrete mix subject to the change of the fineness modulus (M_f) of the fine aggregate are given in accordance with the materials of the calculation for the Penza House Building Combine (see the table).

In addition to these indicators the calculation of such indicators as the number of grains of less than 5 mm in the crushed stone and more than 5 mm in the sand or the PGS (the stability of the change of the quality of the aggregates), the water absorption of the crushed stone, the type of rock of the coarse aggregate is envisaged in the model. The actual activity of the cement can be taken into account in the calculations on the computer, which will make it possible to obtain higher indicators of its economy. The actual activity of the cement being received can also be taken into account in the tabular version.

The tables are compiled for concretes with a temper strength of 70 and 100 percent and for commercial concrete. A large number of formulas, which encompass the entire

range of variation of the above-named indicators of the quality of the materials, were calculated on the M-6000 process control computer complex.

M_f	C (cement)	S (sand)	W (water)
0.9	1.270	0.82	1.107
1.0	1.220	0.84	1.094
1.2	1.150	0.88	1.070
1.4	1.080	0.92	1.045
1.6	1.030	0.96	1.020
1.8	1.000	1.00	1.000
2.0	0.970	1.02	0.985
2.2	0.950	1.04	0.970
2.4	0.935	1.06	0.955
2.6	0.925	1.08	0.945

Note: CS (crushed stone) = 1.0.

The output documents from the computer complex were the basis for the compilation of the correction tables. Such tables were also compiled for other indicators of the quality: the normal consistency of the slurry, the contamination of the crushed stone and sand (the PGS), the bulk density of the crushed stone, the different size of the grains of the coarse aggregate.

The correction with respect to the indicator of the content of sand in the crushed stone (c) and of crushed stone (gravel) in the sand (d) was calculated according to the formulas:

$$S_{est} = S + (Sd0.01) - (CSc0.01); \quad (1)$$

$$CS_{est} = CS + (CSc0.01) - (Sd0.01). \quad (2)$$

Using the tables of the initial formulas and the correction tables, the workers of the construction laboratory in 10-15 minutes turn over to production the necessary working formulas with allowance made for all the indicators of the quality of the materials.

The effectiveness of the tabular method of selecting the formula of concrete was confirmed by the results of its introduction at a number of precast reinforced concrete plants in Penza, Kamenka, Karaganda and Barnaul.

The economic impact from the introduction of the tabular method of calculating the formulas of the concrete mix for three precast reinforced concrete plants of Barnaul and Penza came to 118,000 rubles, about 6,000 tons of cement a year were saved.

The work on the introduction of the tabular or machine (computer) method of selecting the formulas of concrete mix is very promising. It is undergoing further development at enterprises and construction projects of the USSR Ministry of Construction for the purpose of increasing the quality of reinforced concrete components and saving cement.

It is possible to obtain more detailed information from the Stroyindustriya Special Design and Technological Bureau (170034, Kalinin, Ulitsa Yerofeyeva, 5).
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BUILDING MATERIALS

MODELING OF BUILDING MATERIAL PRICES DESCRIBED

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 1, Jan 83 pp 61-67

/Article by A. Kovalenko, candidate in economic sciences: "Price Models for Building Materials and Products (Determining Prices for Building Materials and Products, Depending on Quality")/

/Text/ Along with bringing prices on building materials closer to their social value, a no-less important task of price-formation planning is taking product quality into account in prices. Further development of the building-materials industry depends, to a large extent, on how effectively wholesale prices will facilitate technical progress in the sector, what influence they will exert on improving product quality.

In working out the wholesale prices introduced at the beginning of 1982 on building materials, in order to ensure a methodological standardization in the price formation on local building materials and products, use was made for the first time of sectorial methods directives regarding the procedure for working out price lists, models of price lists, and value coefficients for differentiating prices as to brands and groups.

However, the standardization of price lists has proved to be insufficient. Thus, a comparison of the price lists of just two Union republics (the RSFSR and the UkSSR) shows that the difference in prices between low and high-quality brands of crushed stone and bricks is the same. Moreover, the difference in strength between the low-quality brands of crushed stone amounts to 100 kg/cm^2, and between the high-quality brands--200 kg/cm^2; between the low-quality brands of bricks--25 kg/cm^2, and between the high-quality brands--50 kg/cm^2. It is obvious that the price difference also between the high-quality brands of these materials should be twice as great as that between the low-quality ones. But if in the RSFSR's price list the difference in prices on small-sized wall blocks made of cellular concrete is the same between related brands, in the UkSSR's price list it amounts to 6--9 percent between M25 and M35, M50 and M75, M75 and M100, M100 and M150 and to 24 percent between M35 and M50. Therefore, the sector needs further improvement in price formation as the most important factor for improving the quality of building materials.

Standards have been provided for 8 brands of strength in crushed stone. They correspond to the price lists only in the Belorussian, Kazakh, and Moldavian SSR's; but the price lists of the RSFSR, the Uzbek, Turkmen, Azerbaijan, and Estonian SSR's encompass only 6 brands (in the first the prices are the same on M1000 and

M1200, as well as on M300 and M400); those of the Georgian and Ukrainian SSR's--5 (prices are the same on M1000 and higher, as well as on M200 and M300); those of the Lithuanian SSR--3, the Latvian SSR--2, and the Armenian SSR--1, that is, the prices, in fact, do not depend on strength. All this testifies to the lack of a standardized, scientifically grounded methodology for taking the quality of building materials into account in price formation. In order to take quality into account in prices, it is important to establish a dependency between a product's cost and its consumption characteristics. All products may be divided into simple, whose quality is sufficiently characterized by one basic or main consumption trait, and complex, whose quality is characterized by an aggregate of consumption traits. Included among the simple products are: cement, concrete, clay and silicate bricks, the prices on which depend solely on the brands of strength. Belonging to the category of complex products are the non-metallic building materials, concrete and reinforced-concrete products, etc.

The industry of the non-metallic building materials and the cement industry are combined with the extraction of raw materials, but the product quality in the extraction industry is not linked closely enough with production outlays. The fact of the matter is that the formation of minerals is not directly caused by labor: they are a "gift of nature" and do not cost anything. On the other hand, the expenditures for drilling, for explosive materials, and crushing become higher, as the strength of the rocks being worked becomes higher. But this still does not mean that the stronger rocks are always of a better quality. The aggregate effect of natural and production factors does not make it possible to establish a dependency between the quality of non-metallic materials and their production costs. However, the quality of building materials does exert a large influence on consumption outlays (operational expenditures). And it is easier to establish this dependency than that between quality and production outlays.

An important economic characteristic of building materials is their broad interchangeability. The latter is possible between various types of building materials as well as between the same building material of different quality. Interchangeability makes it possible to construct a price system on various types and brands of building materials.

Determining prices on interchangeable products, as compared with a baseline, is based on the principle of limit prices (with respect to the upper limit): the use of interchangeable products must ensure equal profitability to the customer, that is, an equality of expenditures in manufacturing the final product. For a simple product, whose quality is sufficiently characterized by one basic or principal consumption trait (included here is cement as a "monoproduct" whose quality is differentiated by brands of activity), the formula for differentiating prices depending on product quality is derived from the condition of obtaining the same cost of concrete with equal strength:

$$Ts_0 \cdot U_0 + S = Ts \cdot U + S,$$

where Ts_0 and Ts represent the price of the baseline product and that of the interchangeable one; U_0 and U represent the specific outlay of the baseline and interchangeable product per m^3 of concrete; S is the cost of preparing 1 m^3 of concrete mix. And since the cost of laying concrete and non-ore-type materials with a

change in the brand of cement varies from 5 to 66 kopecks per m^3, the price of the interchangeable product can be determined according to the formula: $Ts = \frac{Ts_0 \cdot U_0}{U}$ (1). Moreover, it should be noted that the more active the cement, the higher is its production cost and the lower its expenditure in the concrete.

The relationship $\frac{U_0}{U} = k$ constitutes the coefficient of the quality of the substitute. It shows that improvement in the quality of the product being turned out is equal in value to the increase in its quantitative output and to however many times and what degree (coefficient) of their substitution. Thus, the prices on cement are inversely proportional to its expenditure per m^3 of concrete. The higher-quality the brand of cement, the lower is its expenditure per m^3, while maintaining the same concrete strength. Increasing the activity of cement on one brand is equal in value to increasing its production by 15--20 percent. Thus, the replacement of M300 cement by M400 brand allows a 17 percent reduction in the norm of expenditure for making concretes of equal strength, and when the M300 is replaced by the M500 brand, the savings in cement amount to as much as 30 percent. These savings, as well as the reduction of transportation outlays per unit of consumption costs, cover the increase of cement production costs involved in improving its quality (by means of increases in labor expenditures, fuel outlays, along with electric-power and grinding expenditures) approximately three-fold. According to data of the NIIZhB [Scientific Research Institute on Concrete and Reinforced Concrete], the replacement of M400 Portland cement, made at the Zhigulevsk Plant, by M500 Portland cement, made at the Belgorod Plant, has led to a lowering of the production costs of interior wall panels at the Moscow ZhBI [Reinforced-Concrete Product] Plant No. 4 by 0.5 rubles per m^3 [1].

Definite correlations also exist between specific expenditures, when various types of cement are replaced. According to the "Standard Norms of Cement Expenditure for Concretes to be Used in Mass-Produced, Precast Concrete and Reinforced-Concrete Products" (SN 386--74), the expenditure of common slag-type Portland cement is 5 percent higher than that of ordinary Portland cement; the expenditure of pozzolanic Portland cement on concretes up to the M350 brand inclusive is 8 percent higher than that of ordinary Portand cement, while on higher-quality brands of concrete it is 15 percent higher. Thus, the relative indicator of expenditure with the replacement of various brands and types of cement remains constant. Let us cite, for example, the quality coefficients of various brands and types of cement (See Table 1).

As a conventional unit of consumption cost, Table 1 takes ordinary M400 Portland cement, as being the most widely utilized at the present time. The quality coefficients are based on the coefficients for replacing various types and brands in concrete, as worked out by the VNIIZhelezobeton [All-Union Scientific-Research Institute on Concrete and Reinforced Concrete] and approved by USSR Gosstroy. As regards special types of cement (for example, sulfate-resistant types), their expenditure in concrete is approximately the same as that of cements for general-construction purposes. But the concretes made with sulfate-resistant cements ensure a longer life for the facilities which are built in aggressive environments and do not require additional outlays, as compared with cements for general-construction purposes. Moreover, considerable savings take place on materials both in building and in operating the facilities. Hence, the quality coefficients are determined here, taking the economic effect into consideration.

Table 1

Quality Coefficients of Various Types and Brands of Cement

Types of Cement \ Brands of Cement	200	300	400	500	600	700	800
Placing cement	0.38	0.45	--	--	--	--	--
Pozzolanic Portland cement	0.7	0.8	0.92	1.07	1.3	--	--
Slag-type Portland cement	0.72	0.83	0.95	1.1	1.32	1.41	1.56
Ordinary Portland cement (with additives)	0.77	0.88	1.0	1.15	1.37	1.46	1.61
Portland cement without additives	--	0.93	1.05	1.2	1.4	1.59	1.76
Rapid-hardening Portland cement	--	0.9	1.08	1.23	1.4	--	--
Sulfate-resistant Portland cement (with additives)	0.85	0.97	1.09	1.3	--	--	--
Sulfate-resistant Portland cement (without additives)	--	1.16	1.3	1.46	--	--	--

Cement quality depends not only on the fineness of the grind but also on the amount of additives. Hence, the prices on ordinary Portland cement have been established 11 percent lower than on cement without additives. In connection with the lower sectorial production cost of pozzolanic cement and the limited demand (since it is used solely for hydraulic-engineering structures), the prices on it have been established 27 percent lower than ordinary Portland cement, although the quality coefficient is only 8 percent lower.

In our opinion, among the shortcomings of the presently existing price list is the reduction of prices on slag Portland cement (inasmuch as its quality coefficient is equal to 0.95, while the prices are 15 percent lower than those for ordinary Portland cement). As a result of this, the profitability of producing slag Portland cement is almost 1.3 times lower than for Portland cement. It has been established that slag Portland cement is not inferior in its properties to Portland cement with additives, and there is no need to lower the prices on it, even though its production cost is one-third lower. But the prices on slag Portland cement, as compared with the 1967 price list, have risen by only 4 percent, in order to compensate for the price rise on granulated slags.

However, the establishment of prices on interchangeable products in proportion to their quality coefficients (consumption characteristics) has stimulated the creation of new, more progressive, and more economical materials (since the entire economic effect of a new material is included in the price); but this has not motivated the customer to make use of them, as a result of which any product becomes equally advantageous for him. In order to create such a stimulus, price formation,

taking material quality into account, should be based on the following principle: what is advantageous for the society as a whole must be advantageous for the individual enterprises. In other words, the production of a more effective product for the national economy should be more profitable for the manufacturers and more advantageous for the consumers. Hence, the economic effect should be distributed between the product's manufacturers and its consumers in such a way that the prices include only part of the effect, whereas another part should be furnished to the consumer.

As we know, the desired price on an interchangeable product is distinguished from the baseline price by the dimension of the economic effect obtained from the quality. The economic effect derived from using various types and brands of cement in concrete by means of various norms of expenditure is characteristic for cement; however, an accompanying effect also takes place in the utilization of sulfate-resistant cements (which we have already remarked upon) and high-strength cements (M550 and higher). Thus, increasing the concrete brand from M300--M400 to M600--M700 ensures a savings on concrete and a reduction in the weight of structural components averaging 20 percent and a lowering of their costs by 7 percent. According to data of the NIIZhB, the savings derived from using M600 concretes and higher in reinforced-concrete structural components amount to more than 6 rubles per m^3.

If "a" is taken as the portion of the economic effect to be included in the price, then, taking "a", the basic and accompanying effect into account, Formula I will change in the following manner:

$$Ts = Ts_0 + a\left(\frac{Ts_0 \cdot \bar{U}_0}{\bar{U}} - Ts_0 + \vartheta\right) = Ts_0 \cdot (1-a) + \frac{aTs_0 \cdot \bar{U}_0}{\bar{U}} + a\vartheta. \qquad (II)$$

Consequently, when forming prices on an interchangeable, traditional product, it is necessary to ensure the same profitability to producers, while on a new, progressive, more effective product production and consumption must be stimulated. Therefore, in the first case, the prices should be the same per unit of consumption cost, while, in the second case, they should be lowered. The former case pertains to cements up to the M550 brand, the latter to those of M550 brands and higher.

In price formation on cement, even though the price models worked out by us have not been used, since 1966 the inversely proportional dependency, as described by us, has been utilized. In the price list No. 06--01, which has been in effect since January 1972, the prices on M300--M500 cement are determined by analogy to Formula I, while on M550 and M600--by analogy to Formula II. The price gap adopted in the presently valid price list between high-quality brands of cement and the traditional ones would be correct if the indicated effect could be implemented not in construction but in the production of reinforced concrete, and the quality coefficients could be raised on M550 to 1.32 and on M600 to 1.54. In reality, the consumption of high-quality brands of cements will be unprofitable, inasmuch as for every ton of reinforced-concrete products the plants will be suffering from 1.2 to 2.8 rubles of losses.

The principal consumption properties of the non-metallic building materials are the strength and large size of the particles. The consumption of crushed stone (gravel) indicates that, as the size of the particles increases, its expenditure per m^3 of concrete also increases, while as the strength of the concrete increases, such expenditure decreases.[2] Inasmuch as the traditional, most widespread product is

usually taken as a base (such a one is crushed-stone particles with sizes of 20--40 mm), the expenditure of which comprises 1 m^3 per m^3 of concrete with a stiff mix of lower-quality brands, Formula I will assume the following simplified form:

$$Ts = \frac{Ts_e}{U} \qquad (III)$$

Taking several consumption characteristics into account in price formation is possible by the methods of multi-factor correlation. The correlation coefficients indicate a great closeness of the connection (from 0.77 to 0.995) between the expenditure of crushed stone, its large size, and strength, close to a staight-line:

$$u = a + bx_1 + sx_2.$$

Since the expenditure of crushed stone for plastic and stiff concretes varies somewhat, in order to average out the results, these two standardized heavy concrete mixes are taker into the calculation. Proceeding from the data of the Manual, we find the following correlation equation:

$$u = 0.912 + 0.0029K - 0.00016M, \qquad (IV)$$

where u is the specific expenditure of crushed stone (m^3); K is the maximum size of the particles (mm); M is the strength of the crushed stone (brand) (kg/cm^2).

Moreover, Formula III assumes the following working form:

$$Ts = \frac{Ts_e}{0.912 + 0.0029K - 0.00016M} \qquad (V)$$

And, indeed, there is a reciprocal dependence in the production of non-metallic building materials: the larger the grain, the less the outlays, and, the higher the strength, the greater the costs. Thus, the cost of large-size concrete fillers is also inversely proportional to their expenditure per m^3 of concrete.

We have established a dependence of the cost of crushed stone for the customer on its basic consumption characteristics, and hence the baseline price must provide for "free delivery to the customer." The price of the free delivery allotted to the cement corresponds to this. The prices on crushed stone in the UkSSR have established free-transport funds. Therefore, in order to determine the baseline price on M200 crushed stone with a particle size of 20--40 mm, it is necessary to add to the price of the free-transport funds the transport outlays for shipping it from the loading area of the quarry to the user-plant. In our case, the free transport funds amount to 2.25 rubles for Zone IV of the UkSSR in accordance with Price-List No. 06--12--02, which encompasses most quarries and oblasts. The cost of hauling 1 m^3 of crushed stone has been accepted on the average for Zhitomir Oblast as 1.61 rubles. In all, the baseline price for 1 m^3 of crushed stone amounts to 3.86 rubles.

But formula V is suitable for differentiating the prices of free delivery to the construction site. And, in order to obtain the price on crushed stone with the free transport funds, we must calculate the average expenditures for transportation. In the final calculation, the formula assumes the following working form:

$$Ts = \frac{Ts_0}{0.912 + 0.0029K - 0.00016M} - T, \qquad (VI)$$

where T is the average transport expenditures per m^3 of crushed stone.

In the building-materials industry accounting for the outlays by brands and particles is not conducted in the same way as it is by sorts and classes in other sectors of industry. And the difference in the cost of crushed stone according to the model which has been worked out is inherent to it as a result of the difference in the specific expenditures of crushed stone of various brands and particle sizes per m^3 of concrete. Therefore, while taking into consideration the conventionality of calculating the production costs of crushed stone (gravel) by brands and particles, we must recognize differentiation of crushed-stone costs, depending on quality, in accordance with the derived formula, as the most precise method.

By changing the constant coefficients in Formula VI, we can achieve any desired degree of price differentiation; and it will be well-founded, since it will depend on the brands of strength and the size of the crushed-stone particles. Thus, for determining prices in accordance with the existing price list, the following formula is recommended:

$$Ts = \frac{Ts_0}{0.677 + 0.009K - 0.00016M} - T. \qquad (VII)$$

As may be seen from Table 2, the prices for particle sizes of 3--10 mm, 10--20 mm, and 20--40 mm are in close accord with the formula and the price list, and they deviate only for particles size of 40--70 mm. This allows us to conclude that, in working out the price list, the prices for the largest particle-size category were not lowered sufficiently, and, in a new revision, they ought to be reduced by another 14--17 percent. According to the formula, the difference in prices between related particles decreases from the large particles to the small ones as follows: between particle sizes of 40--70 and 20--40 mm the difference is 57--60 percent; between particle sizes of 20--40 and 10--20 mm it is 37--42 percent, and between particle sizes 10--20 and 3--10 mm it is 18--20 percent. The difference in prices between low-quality brands amounts to 2.7--3 percent, while between high-quality brands it is 5--7 percent. So it must be, because the difference in strength between brands M200 and M300, M300 and M400 comprises 100 kg/cm^2, while that between brands M400 and M600, M600 and M800, as well as between M800 and M1000 is 200 kg/cm^2.

It should be noted that in the new price list No. 06--12 (UkSSR), as well as in the currently existing one, the prices on M300 crushed stone have been equalized to those on M200, while the prices on M1200 and higher have been equalized to those on M1000. In fact, as we have noted, in the first instance they should be differentiated by 3 percent, and, in the second instance by 6 percent.

In the new price handbook of the RSFSR, in contrast to the UkSSR price handbook, identical prices have been established on brands M300 and M400; the prices on brands M1000 and M1200 are also identical, but then new prices appeared on M1400. M1400 crushed stone has been designed for M700 concretes, and, although their

Table 2

Comparison of Wholesale Price Levels per m^3 of Crushed Stone for Zone IV of the UkSSR

Particles / Brands	3--10 mm		10--20 mm		20--40 mm		40--70 mm	
	Price List	Formula	Price List	Formula	Price List	Formula	Price List	Formula
200	3.70	3.64	2.95	3.07	2.25	2.23	1.70	1.42
300	3.70	3.76	2.95	3.16	2.25	2.29	1.70	1.46
400	3.95	3.88	3.10	3.25	2.40	2.36	1.80	1.50
600	4.15	4.14	3.25	3.46	2.50	2.49	1.90	1.58
800	4.40	4.43	3.45	3.68	2.65	2.64	2.00	1.66
1000	4.65	4.75	3.65	3.93	2.80	2.79	2.10	1.85
1200	4.65	5.1	3.65	4.19	2.80	2.96	2.10	1.85

production has not been developed on a mass scale, in the UkSSR we should also stimulate the ouput of such crushed stone by means of raising the prices.

Let us also note as a shortcoming the fact that prices on gravel and crushed stone, obtained by crushing gravel, have been established as identical throughout the entire territory of the Ukraine. This would be justified if these materials were produced only in oblasts belonging to a single price zone. In reality, this is not the case. There is another violation of the standards, for example, in the RSFSR, where the prices on gravel do not depend on strength.

Various brands of bricks and concretes constitute parametric series; analysis of their connection with costs shows that this dependence is a straight-line one. According to the straight-line equation, the cost of concrete is made up of one part which changes in direct proportion to strength (similar to the changing expenditures in the production costs), and an unchanging part (similar to the conventionally constant expenditures). Moreover, the formula for determining the prices on concretes will assume the following form:

$$Ts = 0.0444M + 11.23. \qquad \text{(VIII)}$$

The straight-line dependence of prices on brands of strength is also characteristic of price list No. 06--14--01, which has been in effect in the RSFSR since 1976, although standardized coefficients for differentiating prices on concretes had not yet been used.[3] This testifies to the fact that that concrete costs are in a straight-line connection with strength. In order to derive the formula for a

straight-line dependence, it is necessary and sufficient to have the prices of two brands of a parametric series of concretes. In deriving straight-line dependence formulas based on production costs or prices, each region of territorial differentiation requires its own formula; there should be five of these for the Ukraine. But, in order to standardize prices on local building materials, there must be one, universal formula for all regions of differentiation. In order to solve this problem and derive a universal formula of a straight-line dependence of the price level on strength in accordance with the methods described above, let us use the price indexes for M150 and M600. In this case the recommended working formula for determining wholesale prices on concretes will assume the following form:

$$Ts = Ts_c \cdot (0.0018M + 0.46), \qquad (IX)$$

where Ts is the baseline price for the region of territorial differentiation, as adopted for M300 and having the widest possible application.

Let us compare the existing prices and those determined in accordance with Formulas VIII and IX (See Table 3).

From the calculations cited here it follows that the prices on the low-quality brands of concrete should be reduced, while on those from M200 upward they should be raised. If even enterprises operating at a loss, such as the Reinforced-Concrete Products Plant of the Chernigovpromstroy Trust, at the proposed price level will have as much as 15 percent profit on M50, then the recommended price reduction on the low-quality brands is completely well-founded. The level of existing prices on concrete brands M400--M500 does not ensure a cost reduction per unit of useful effect (per kg/cm^2) (See Table 3). In this case, we must eliminate the discrepancy by means of the proposed price increase. The greatest price increase falls on M300 and M350 concretes, which is likewise well-founded, inasmuch as their production and consumption is carried out on the largest scales.

The straight-line nature of the dependence between a concrete's brand and its cost indicates the fact that this principle has also been extended to other brands of concrete, which are a supplement or a continuation of the parametric series. The formulas of straight-line dependence allow us to effective determine prices of output of new quality and engage in price forecasting. Thus, obtaining M1000 concrete is still a matter of the future, be we can already cite its price per m^3:

$$Ts_{1000} = 0.0444 \cdot 1000 + 11.23 = 55.63 \text{ rubles}$$

Wholesale prices are established on clay and silicate bricks proportionally to quality coefficients, which compensate for outlays to the manufacturers and ensure an increased profitability for high-quality products (See Table 4).

It may be seen from Table 4 that the difference in prices between related brands of bricks is the same and amounts to 10 percent, while the difference in strength between the low-quality brands of bricks is 25 kg/cm^2; between high-quality brands it is 50 kg/cm^2. Furthermore, the same gap in prices has stimulated the output not of the high-strength M250--M300 bricks but only that of M150 bricks, which, in our opinion has no grounds for justification. The gap between prices on the high-quality brands should be greater than between the prices on the low-quality brands.

Table 3

Comparison of Price Levels per m^3 of Concrete for Zone I of the UkSSR

Brand of Concrete	Quality Coefficient	Price (in rub.)		Discrepancy (in rub.)	Proportionate Cost (in rub. per kg/cm^2)	
		Existing	Formula		By Price List	By Formula
50	0.87	16.2	13.50	—2.7	0.324	0.269
75	0.89	16.6	14.61	—1.99	0.221	0.194
100	0.92	17.1	15.72	—1.38	0.171	0.157
150	0.96	17.9	17.93	+0.03	0.119	0.119
200	1.0	18.6	20.14	+1.54	0.093	0.1
250	1.09	20.3	22.35	+2.05	0.081	0.089
300	1.18	21.9	24.56	+2.66	0.073	0.082
350	1.29	24.0	26.77	+2.77	0.069	0.077
400	1.43	26.6	28.98	+2.38	0.066	0.073
450	1.6	29.9	31.19	+1.29	0.066	0.069
500	1.78	33.1	33.40	+0.3	0.066	0.067
600	2.04	37.9	37.82	—0.08	0.063	0.063

Table 4

Coefficients for Differentiating Wholesale Prices on Bricks

Bricks \ Brands	75	100	125	150	200	250	300
Clay	0.9	1.0	1.1	1.2	1.3	1.4	1.5
Silicate	0.75	0.85	1.0	1.1	1.2	1.3	--

In this regard, the quality coefficients adopted for concrete were constructed more correctly: they increase from the low-quality brands to the high-quality ones and all the more so as the difference in the strength of related brands becomes greater. But this does not mean that prices ought to change in direct proportion

to strength. The economic basis of technical progress requires a reduction in the unit cost of material strength (per kg/cm^2). This may be achieved with the outstripping growth of material strength over the growth of prices on them, that is, with a straight-line dependence of prices on strength.

In order to derive a formula of straight-line dependence, it is necessary and sufficient to have baseline prices on two brands of bricks. For the purpose of the closest possible approximation to existing prices, let us take for calculations on clay bricks the price indexes of brands M100 and M250. In this case the formula for differentiating wholesale prices on clay bricks will assume the following form:

$$Ts = Ts_0 \cdot (0.0026M + 0.74). \qquad (X)$$

Thus, in order to differentiate brick prices for any oblast, it is sufficient to determine the baseline price. The price of the most widespread brand of bricks--M100--is taken as the baseline price. In accordance with Formula X, the prices on M75 clay bricks should be raised by 4.3 percent. In accordance with the requirements of USSR Gosstroy, ordinary M75 bricks can be used only in low-storey construction and by special permission of the USSR Ministry of the Building Materials Industry. Such a price will place a limit on its demand, regardless of Gosstroy's requirements. The proposed method for price differentiation on bricks provides for an increase in prices on related brands up to M150 by 6--7 percent and on brands from M150 to M300 by 9.4--11.5 percent. This would provide greater stimulation to produce high-quality brands of bricks. Hence, lowering prices on M150 as much as 4 percent will be well-founded. All this testifies to the fact that applying the derived formula is fully justified.

In order to derive a formula for a straight-line dependence for silicate bricks, let us adopt for our calculations the price indexes on brands M100 and M250 for the purpose of approximating existing prices as closely as possible. Herein the formula for price differentiation will assume the following form:

$$Ts = Ts_0 \cdot (0.00326M + 0.59) \qquad (XI),$$

where the cost of M125 silicate bricks, the most widespread brand, will be taken as the baseline price. According to Formula XI, the prices on silicate bricks, with the exception of brands M75 and M300, should be lowered. The greatest price reduction (9.4 percent) should occur on M150 bricks, the prices on which are obviously inflated.

Utilization of the straight-line equation for determining prices satisfies all the requirements of the methodology of price formation on the new output for production-engineering purposes: prices are determined on the basis of the level of existing prices on analogous, already developed output: their increase lags behind the increase in the strength of bricks and concretes by brands. This ensures the improvement of price formation outlined for the years 1981--1985: in establishing wholesale prices on new products, provision has been made for lowering their level per unit of useful effect (per kg/cm^2) (See Table 3).

The volumetric weight of building materials is directly proportional to strength. When the strength of concrete increases, the cost of producing it also grows, and

when the volumetric weight increases with the strength remaining constant, this cost decreases. Each brand of keramzit concrete and cellular concrete can be made in various volumetric weights (from 500 to 1800 kg/m^3). Therefore, the prices on products made of lightweight and cellular concretes should simultaneously stimulate reductions in the weight and cost of structural components. For this reason the prices on large and small wall blocks made of lightweight and cellular concretes ought to increase as the strength increases and decrease as the volumetric weight increases. In order to establish this dependence and describe it mathematically, let us use data from the proposal of V. Karelin and V. Novikov with regard to establishing wholesale prices on small wall blocks made of cellular concrete.[4] The formula, derived by the method of multi-factorial correlation, will assume the following form:

$$Ts = 0.0469M -- 0.0103B + 26.8, \qquad (XII)$$

where Ts is the price (in rubles) per m^3 of wall blocks made of cellular concrete; M is the strength of concrete (in kg/cm^2); B is the volumetric weight (in kg/m^3). However, for deriving Formula XII and for calculating the existing prices, use has been made of various bases, which must be integrated. If we take the price of wall block M35 (B = 700 kg/m^3) as a baseline price, then the recommended working formula for determining wholesale prices on wall blocks made of lightweight concretes varies in the following manner:

$$Ts = Ts_0 (0.0022M -- 0.000485B + 1.2625) \qquad (XIII)$$

Price differentiation in accordance with Formula XIII demonstrates that, as the volumetric weight of concrete increases, for every 100 kg/m^3 the price steadily declines by 1.51 rubles, and as the brand goes up, for every kg/cm^2, the price increases by 6.9 kopecks.

We have examined the differentiation of wholesale prices within the individual types of building materials; this ensures a well-founded correlation of prices on various brands and particle sizes. But no less important is harmonizing the correlation of prices on various types of interchangeable building materials. Let's take, for example, the most widespread interchangeable materials--those used in walls. Determining the degree of interchangeability (effectiveness) must be accomplished here on the product which is created out of them at the customer's site, i. e., on the finished (end) product of construction--on the cost of the walls which have been erected, taking into consideration the expenditures on the use of the buildings and structures, rather than on the cost of producing these materials, forming the basis of the prices on them (See Table 5).

In order to determine prices on wall materials, Formula II must be altered into the following form:

$$Ts = Ts_0 \cdot (1 -- a) + akTs_0 \qquad (XIV),$$

where k is the quality coefficient.

Proceeding from everything which has been set forth here, we can draw the following conclusions: in forming the prices on building materials it is necessary to

Introduce economic-mathematical methods of price formation, which have not been used here up to now; the recommended price models not only provide results which are close to the existing prices but also allow errors in calculation to be excluded; utilization of the price models which have been worked out on building materials is possible regardless on conditions of place and time; the absolute amount of the prices on a product with the same consumption cost may be different in various regions, but the correlation of prices and quality ought to be the same everywhere.

Table 5

Calculation of Price Correlations on Interchangeable Wall Materials

Types of Wall Materials	Cited Expenditures (in rub.)		Value Quality Coefficient
	Per 100 Units of Conventional Bricks	Per m^2 of Wall	
Clay bricks	94.8	24.1	1.0
Laminated reinforced-concrete panels	82.3	20.9	0.87
Silicate bricks	78.4	19.9	0.83
Large concrete blocks	71.9	18.2	0.76
Keramzit-concrete panels	56.8	14.4	0.6
Panels made of cellular silicate concrete	50.7	12.9	0.54

* "Ekonomicheskaya effektivnost' proizvodstva i primeneniya stenovykh materialov i konstruktsiy" [Economic Effectiveness of Producing and Utilizing Wall Materials and Structural Components], Ed. A. Ya. Rekitar, Moscow, Stroyizdat, 1972, p 149.

FOOTNOTES

1. I. Tsygankov, "Tekhniko-ekonomicheskiy analiz sposobov proizvodstva sbornogo zhelezobetona" [Technical-Economic Analysis of the Methods of Precast, Reinforced Concrete Production], Moscow, Stroyizdat, 1973, p 15.

2. "Rukovodstvo po tekhniko-ekonomicheskoy otsenke sposobov formirovaniya betonnykh i zhelezobetonnykh izdeliy. NIIZhB, NIIES, VNIIZhB" [Manual on the Technical-Economic Evaluation of Methods of Forming Concrete and Reinforced-Concrete Products. NIIZhB, NIIES, VNIIZhB], Stroyizdat, 1971, pp 116--124.

3. A. P. Kovalenko, "Differentiation of Wholesale Prices on Concretes, Depending on Quality," BETON I ZHELEZOBETON, No. 9, 1978.

4. V. S. Karelin et al., "Sovershenstvovaniye metodov tsenoobrazovaniya na stroitel'nyye materialy i konstruktsii" /Improving the Methods of Price Formation on Building Materials and Structural Components/, Moscow, Stroyizdat, 1976, p 130.

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